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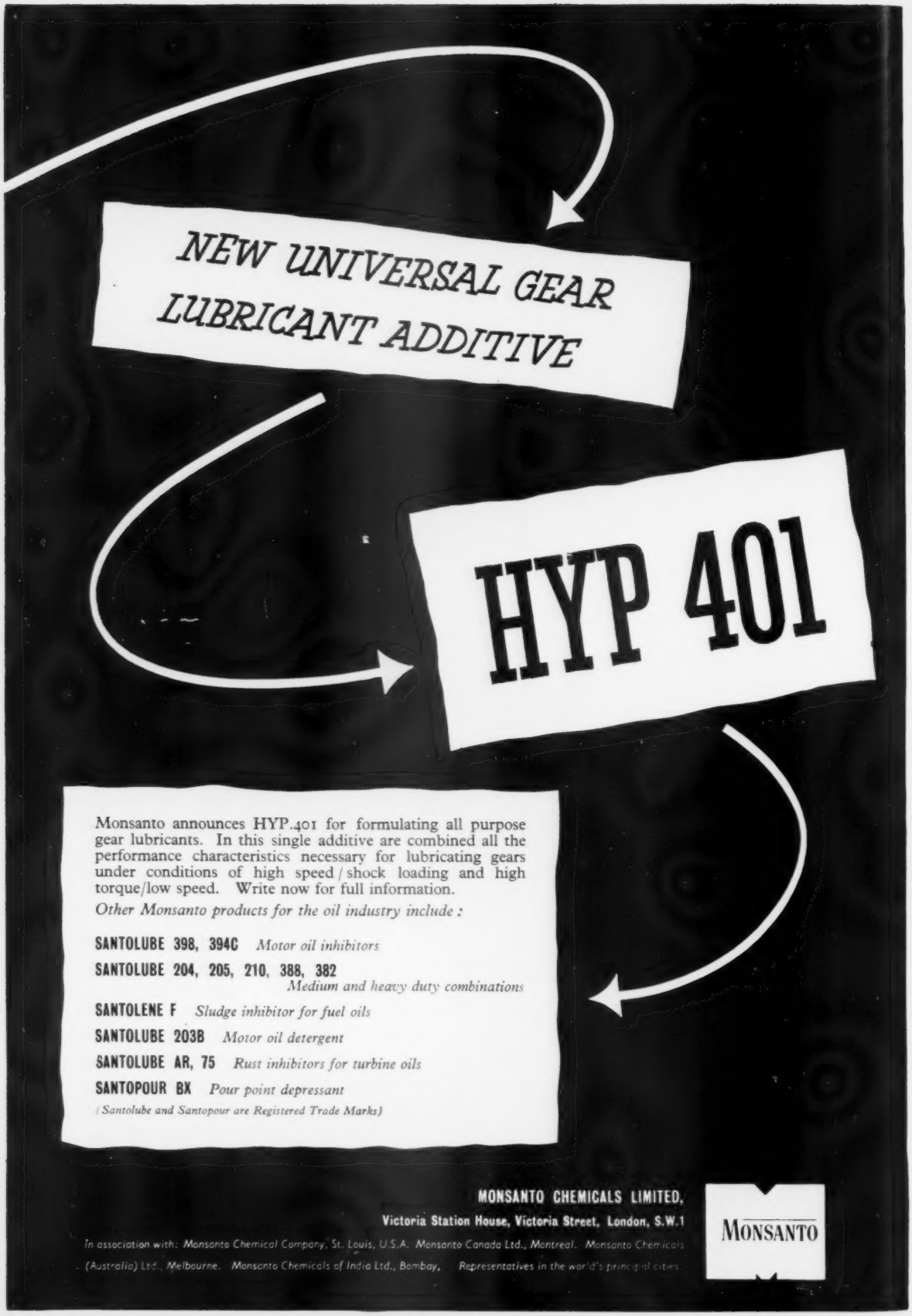

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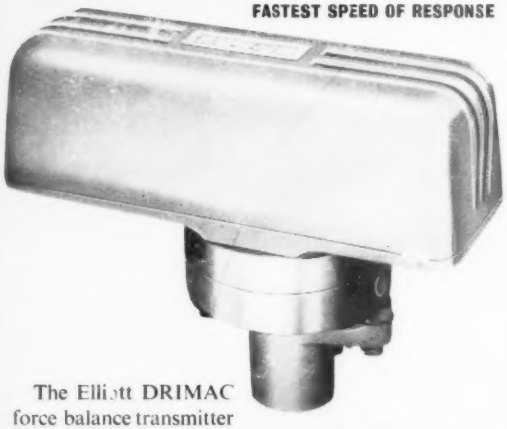

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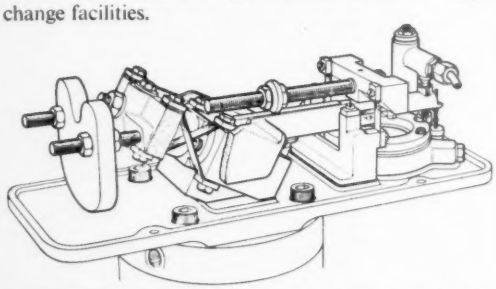

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Contents

THE CHANGING PATTERN OF PRODUCTS DEMAND . . . 85

IP STUDENTS' SECTION DINNER 89

AROUND THE BRANCHES 91

DRAWING THE IP MONOGRAM 94

CHEMICAL ENGINEERING: PART X—FILTRATION . . . 95
By *D. C. Freshwater*

PERSONAL NOTES 98

BOOKS AND FILMS 99

TRADE LITERATURE, ETC. 101

NOTES OF THE MONTH 102

FORTHCOMING MEETINGS 104

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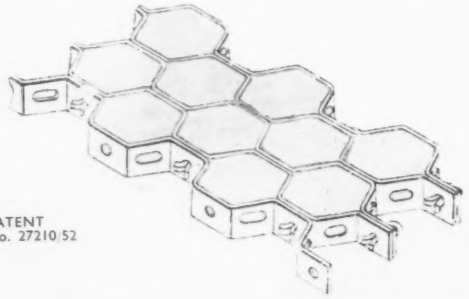

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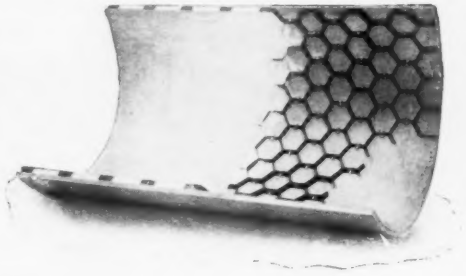

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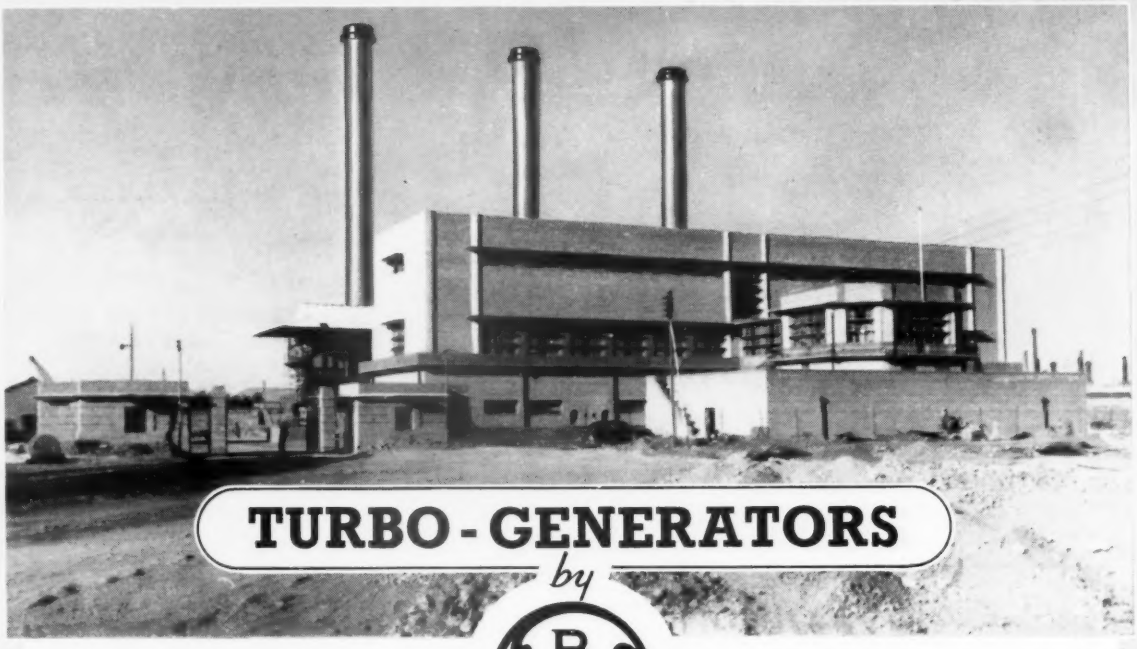

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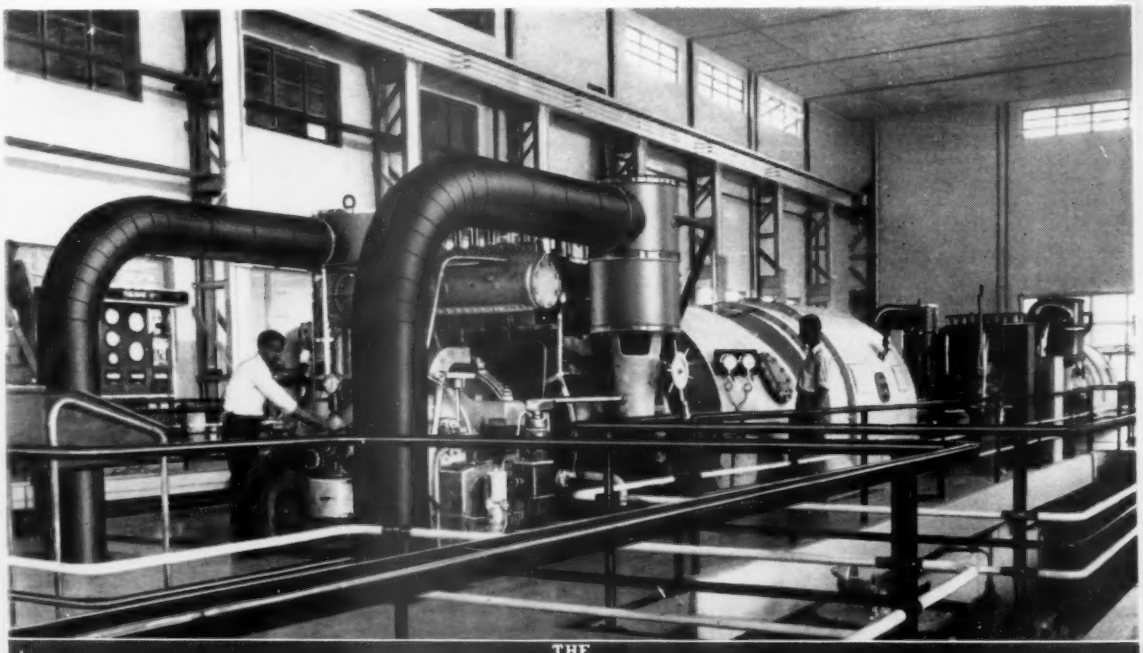

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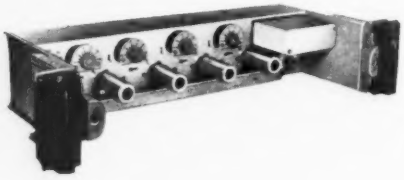

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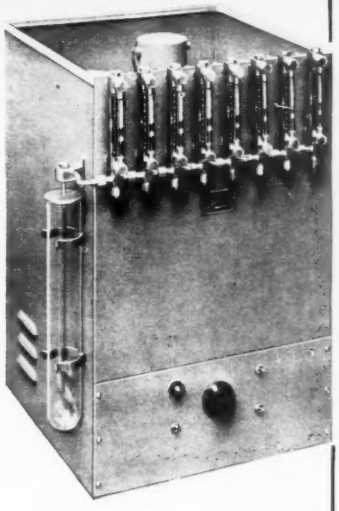

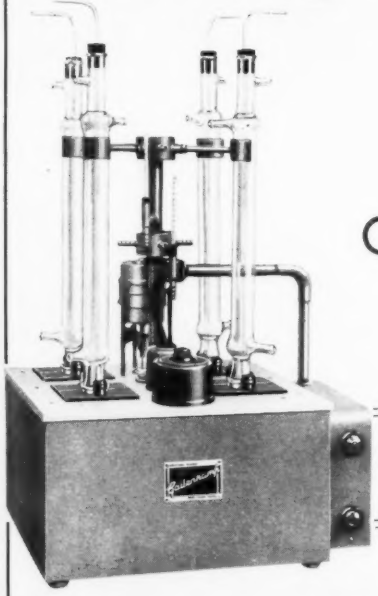

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The Changing Pattern of Products Demand

By **M. E. HUBBARD (Fellow)**

At a meeting of the Economics and Operations Group of the Institute under the chairmanship of O. F. Thompson on 6 January, 1954, M. E. Hubbard introduced a discussion on the changing pattern of products demand. Mr Hubbard said:—

We, in the oil industry, take pride in the fact that, except for a very short period immediately after the last war, the world has never been short of any of the petroleum products it required. This is not quite synonymous with saying that the world has never been short of oil. We all know the phenomenal rate of increase in total demand. What is perhaps less spectacular, but just as important, is the ability to make finished products available in the required proportions and the required qualities.

I want to deal with this question of proportions. So often one hears the question "why is the pattern of refinery output so different in the U.S.A. from elsewhere, and can we not expect the pattern outside the U.S.A. to draw closer to this as consumption increases?" I want to answer that and show how it is developing.

The first point to consider is the pattern of energy requirements and how that is met. By energy I mean the total energy from all sources, coal and hydro-electricity, as well as oil and natural gas.

In the charts I have tried to combine both a comparison of quantities and a comparison of proportions.

The Consumption of Primary Energy in the U.K. and U.S.A.

Chart 1a shows the total primary energy consumed per head of population in the U.K. each year in comparison with that consumed in the U.S.A. The two upper circles show the actual totals of primary energy with its make-up, by sectors representing the proportions supplied by coal, oil, natural gas, and hydro-electric power—no atomic energy as yet!

The first point to note is that the total energy used by the average American is virtually double the quantity used by an average person in the U.K. In terms of hard coal equivalent the U.S. uses 8.66 tons *per capita* each year compared with 4.72 in the U.K.

The vastly bigger oil requirement stands out as a major difference in the composition of the two energy supplies, but just as important is the natural gas consumption in the U.S.A. Natural gas represents over 20 per cent of the U.S. total energy and, in terms of B.T.U., contributes more than half as much as their total liquid oil supply.

The lower blocks show how this energy is used, their lengths giving the relative proportions, and their area the absolute quantities—*per capita* in each case.

Not all this primary energy is used directly. A considerable portion is changed into other forms. Thus in both countries roughly the same proportion, just over 15 per cent, is used to generate electricity. The U.K. uses a somewhat higher proportion for coke ovens—10 per cent compared with 7 per cent—though in actual tons per head the U.S. uses more (0.62 tons

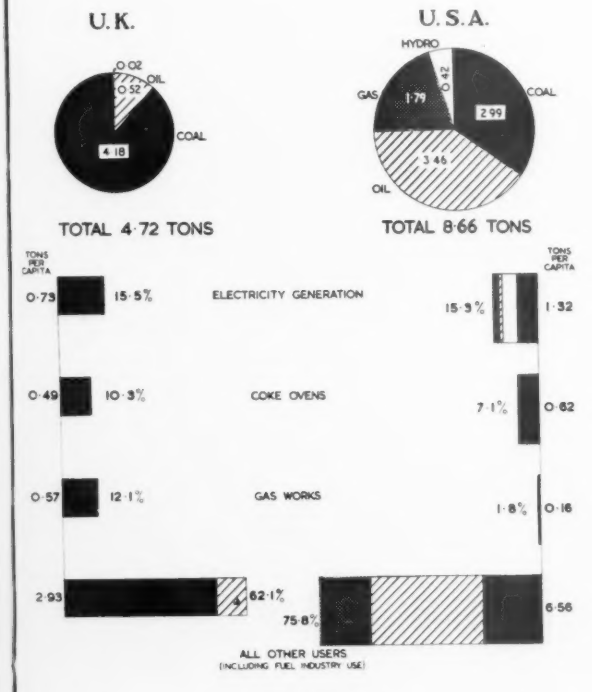

Chart 1*a*

Consumption of Primary Energy per capita.

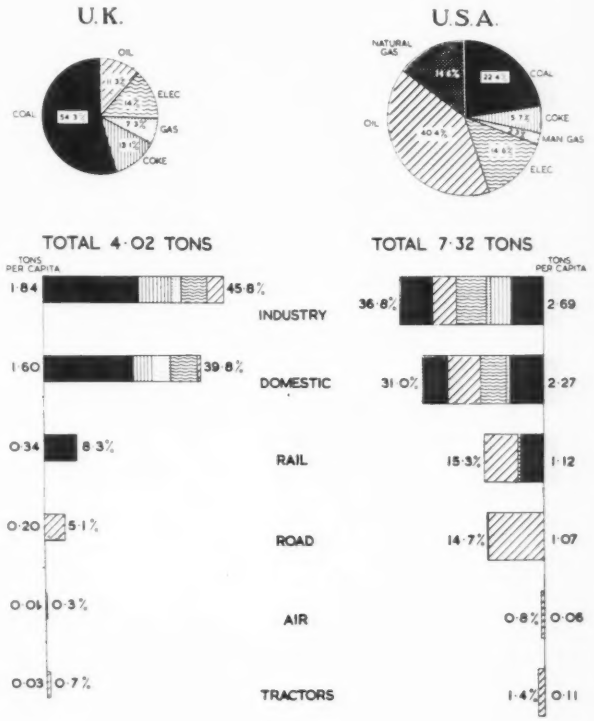

Chart 1*b*

Energy Consumers and Type and Quantity of Energy Used per capita (excluding fuel industries consumption).

compared with 0.49 in the U.K.). For town gas production we naturally use far more, over 12 per cent of our primary energy. The U.S.A. *make* little gas as they are fortunate enough to have such huge reserves of natural gas.

The last pair of blocks show the primary energy used directly, including that used in its own production, for instance refinery and pipeline fuel, coal used at the mines, and so on.

Analysis of Consumption by Main Users

Chart 1b is arranged in the same way as chart 1a, and shows how the energy is actually used by consumers. The segments of the circles represent the proportions used in the forms of oil, coal, coke, electricity, manufactured and natural gas. In the U.K. over half of consumers' energy requirements are met by the direct use of coal; less than a quarter is the proportion in the U.S.A.

The blocks show the energy used in the main consuming sectors and bring out one obvious difference, namely the greater proportion used for all the various forms of transport in the U.S.A. compared with requirements in the U.K. Apart from this the general pattern is not dissimilar. In both countries the biggest single consumption is industrial, with domestic consumption following close behind.

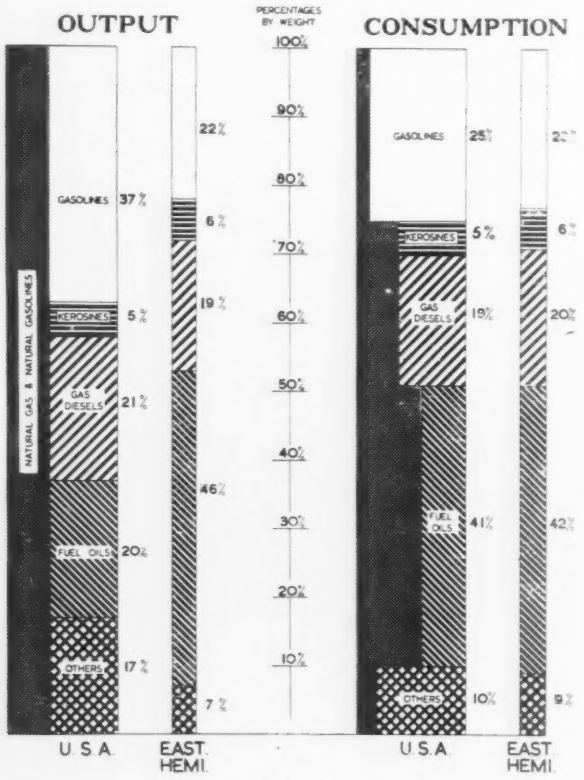

Chart 2

Refined Products and Natural Gas in the U.S.A. and Eastern Hemisphere.

Comparing the two countries, the fundamental needs for energy are by no means dissimilar, and it is in the forms in which the energy is used that the big difference lies.

Output and Consumption of Refined Products and Natural Gas

Coming now to oil, the left hand half of chart 2 gives a comparison of the output of refined products, firstly, in the U.S.A.

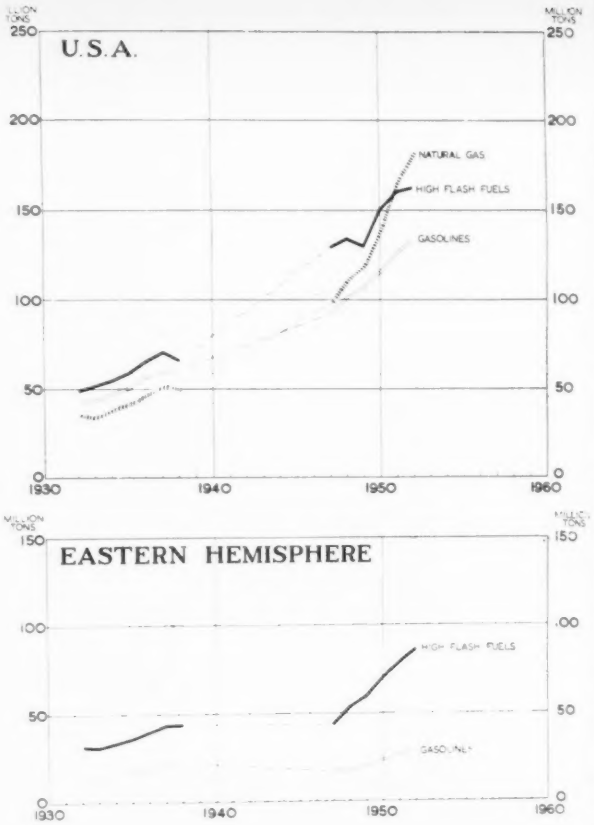

Chart 3

Gross Consumption 1932-52 *(including bunkers). Gasolines include natural gasoline; high flash fuels are kerosine, gas oil, diesel oil and fuel oil; natural gas (used as fuel only).*

and, secondly, in the Eastern Hemisphere as a whole. The two product output columns bring out the fact we all know, that the proportion of gasoline as a percentage of crude in the U.S.A. is not far short of double that in the Eastern Hemisphere, and conversely, the residual fuel output in the U.S.A. is less than half that on this side of the Atlantic.

Alongside the American refinery output column is shown their natural gas and natural gasoline output to scale.

Fortunately, the Americans are very statistically minded and the ultimate consumption of natural gas is known in some detail. Excluding natural gas used for carbon black and chemical manufacture, and considering only the proportion used as fuel, it is possible to break down the consumption of gas into categories corresponding to the main oil products. Natural gasoline supplements gasoline. A range of users, notably domestic, would, if gas were not available, burn distillate fuels. In power stations and heavy industry, gas is an alternative to residual fuels.

If the use of natural gas, in terms of corresponding oil fractions, is added to the consumption of actual oil products, we can build up the combined column shown on the right of the chart, which represents, in effect, the consumer demand for oil and gas combined, expressed in terms of the conventional oil products.

Alongside, is the corresponding consumption of oil in the

Eastern Hemisphere. There is no gas to be added here. It is quite extraordinary how similar are the divisions of these two columns:

	U.S.A. per cent	*Eastern Hemisphere per cent*
Gasolines	25	23
Kerosines	5	6
Gas/diesels	19	20
Fuel oils	41	42
Others	10	9

So we can say that the fundamental pattern of demand for oil and gas together is very much the same in the United States and elsewhere. The difference lies in the fact that outside the United States natural gas is not at present available. The oil industry outside the U.S.A., therefore, must meet with oil alone an inland demand similar to that met by oil plus gas in the U.S.A.

The next question to consider is whether this pattern is changing, and the best way to do so is to carry this combined oil plus gas analysis back over the last 20 years. Unfortunately, separate figures for middle distillates and fuel oils are not available for the whole period so we can only consider gasolines, high flash fuels (*i.e.*, kerosines and heavier) and, in the U.S.A., gas used in lieu of high flash fuels.

Gross Consumptions of Gasolines, High Flash Fuels and Natural Gas

Chart 3 shows the consumption of these three components in a conventional form. In the upper half of the chart are the three lines for the U.S.A. The bottom of the chart, to the same scale, shows consumption of gasoline and high flash fuels in the Eastern Hemisphere.

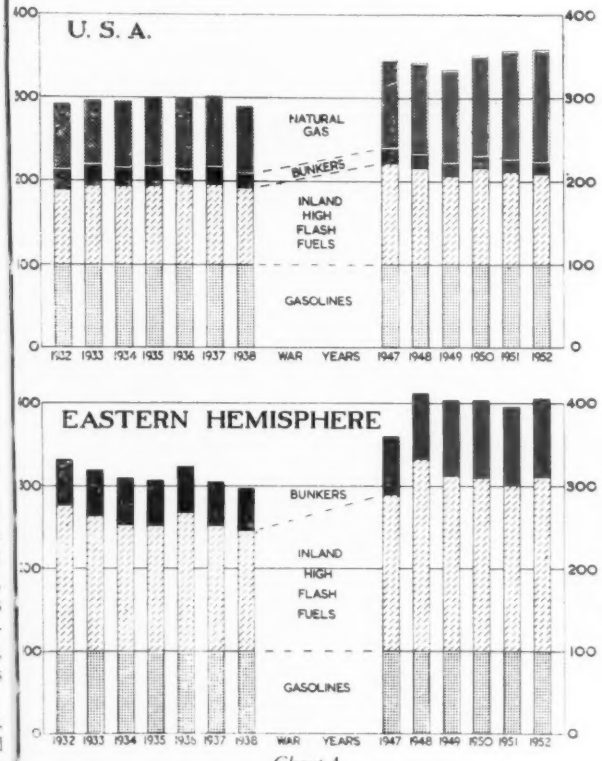

Chart 4

Relative Consumptions of Gasolines, High Flash Fuels, and Natural Gas.
Gasolines 100

Obviously, in this hemisphere the ratio of high flash fuels to gasoline has risen since the war, but the fundamental trend in the U.S.A. is not so obvious.

A better way of bringing out these changes in ratio is to take gasoline as a yardstick and show the tonnages consumed of the other fuels for every 100 tons of gasolines.

Relative Consumptions of Gasolines, High Flash Fuels, and Natural Gas

Chart 4 shows the ratios, in column form, for the years since 1932 (excepting the actual war years), for the U.S.A. and the Eastern Hemisphere. Bunker demand is shown separately from

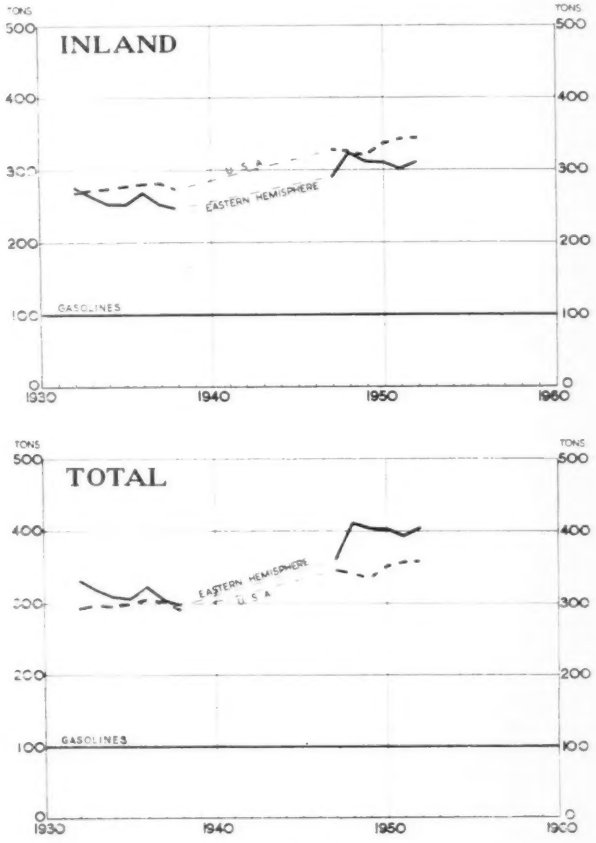

Chart 5

Consumption Ratios—Total Oils plus Natural Gas per 100 *tons gasolines.*

the inland demand for high flash fuels since it represents such very different proportions in the two areas.

For every 100 tons of gasoline burned in the U.S.A. in 1932 there was a total of about 110 tons of high flash fuels used for inland and bunker purposes, plus a further 80 tons of natural gas used in replacement of high flash fuels. Looking across the set of columns, we see that though the total for high flash fuels has only risen imperceptibly over the period as a whole, the inland use of high flash fuels has risen appreciably, and when natural gas is added, the total non-gasoline fuels have risen considerably—from 190 tons to nearly 260 tons per 100 tons of gasolines.

This chart also shows the Eastern Hemisphere pattern. Before the war the consumption of "other fuels" was decreasing slightly relative to gasoline, but since the war it has reached much higher levels. The very high levels shown in 1948 and 1949 are perhaps due not so much to the rise in high flash fuel demand as to the

fact that gasoline consumption was still restricted. Without this the post-war proportional blocks would have looked more like a regular staircase.

Both inland and bunker requirements have contributed to the rise in high flash fuel ratio.

It is a striking fact that bunkers take a much bigger place in the Eastern Hemisphere than in the U.S.A. The actual tonnage of bunkers is roughly twice, so that, divided by the much smaller inland consumption, the influence of bunker trade is relatively some seven to eight times greater in the Eastern Hemisphere than in the U.S.A. This is a point of considerable importance because such a lot of bunkers are delivered in places where there is only a very small off take of motor spirit (*e.g.*, Aden, Gibraltar, Atlantic Islands) and this leads to extreme local variations in ratios.

Ratio of High Flash Fuels plus Gas to Gasolines

Finally, chart 5 shows the ratios of high flash fuels, plus gas, to gasolines, on the upper half for inland demand, and below for total demand, including bunkers.

In the U.S. inland trade the ratio of other fuels to gasoline has been climbing pretty constantly over the last 20 years. In the Eastern Hemisphere it was dropping before the war, but since then it seems to have been keeping generally parallel, though below the U.S. line. In total trade the inclination of the U.S. line is slightly less because their bunker demand has not grown as fast. The Eastern Hemisphere total consumption line has always been above the U.S. and rising, at least in later years, at a slightly steeper rate.

In the early days of the oil industry the primary product was kerosine. Gasolines and fuel oils were surplus products, and when a user could not be found they had to be burnt off. Early this century gasoline became the primary fuel and cracking processes were developed to give the industry the flexibility needed to balance its output with demand.

These charts tend to suggest a gradual reversal, in so far as the need for gasoline is now lagging behind the need for other fuels. This is masked at present by the fact that in the one market which consumes over half the world's oil, natural gas has cornered a very large share of the market which otherwise would call for the heavier petroleum products. What is going to happen in those parts of the world where natural gas is not available? That is what I suggest we discuss.

Discussion

Opening the discussion, Dr P. H. Frankel referred in particular to chart 2, showing how energy requirements are met in the U.S.A. and in the Eastern Hemisphere respectively. He felt that the thought that petroleum products in the Eastern Hemisphere have to do what refined products *and* natural gas are doing in the United States was subject to two qualifications. Firstly, in the U.S.A. both petroleum and coal are indigenous products, whereas in some of the more industrialized countries of Europe coal is home-produced and oil is imported. Secondly, in the United States natural gas owed its role mainly to the fact that it was cheap, in many parts of the United States cheaper than coal and fuel oil. In fact, Dr Frankel was of the opinion that price relationships in the Eastern Hemisphere would have to be taken into close account before any firm conclusions could be arrived at regarding the future role of fuel oils.

Dr Frankel also thought that Mr Hubbard's later charts, dealing with the relative importance of bunkers in the United States and the Eastern Hemisphere, were particularly interesting. There were, of course, many reasons for the differences in bunker off take in the two areas, but he mentioned two in particular—the great land mass of the United States, making for the intensive use of inland transport, as against the ratio of inland locations to coastlines in Europe making for a high proportion of sea-going traffic. A second main reason, according to Dr Frankel, lay in the convenient locations of Eastern sources of supply for bunkering purposes.

In his contribution to the discussion, C. Chilvers also commented particularly on chart 2. In his view the inclusion of natural gas production with refined petroleum products was not entirely acceptable. An examination of the sources of energy in the United States over the years showed that coal's contribution to total energy requirements had declined from 50 per cent in 1938 to about 30 per cent in 1953, and estimates for the future suggest that by 1956 it may be as low as 22 per cent. On the other hand, oil's contribution by 1956 may rise as high as 46 per cent and natural gas for the same year to as much as 27 per cent. Mr Chilvers concluded that a large part of the increase in natural gas must have been at the expense of coal, and for this reason the inclusion of the total natural gas consumption with petroleum products must distort the utilization picture.

Mr Chilvers also highlighted the distortions in the pattern of products demand which may be produced by the operation of external factors and gave as an example the incidence of taxation on motor gasoline consumption in the Eastern Hemisphere. In his view the effect on the pattern of refinery production in that area seemed to offer a potent reason for divergence from the United States—and also perhaps from the most desirable pattern of operations.

In conclusion, Mr Chilvers referred to the future outlook. There was evidence to suggest that a 10 per cent change in industrial production had been associated on average with a 6 per cent change in total energy requirements. On the assumption that the general trend of the index of production in the United Kingdom would show an increase of about 2 or 3 per cent p.a., it seemed improbable that the contribution of coal would be sufficient to meet the increase in energy requirements. Thus, there was a future potential, in the U.K. at least, for an increasing contribution by petroleum to the total energy balance.

E. G. Moline reverted to the influence of price on the consumption of natural gas. He gave as an instance the fact that in the Washington area of the United States it had been cheaper for at least the last 15 years to use natural gas for domestic central heating rather than coal or No. 2 oil and in his view this price relationship was likely to continue to exist for the next few years at least, although in the more distant future the price factor might not be so favourable to natural gas and to petroleum.

D. A. Lindsell underlined the point raised by Mr Chilvers that the future rate of increase of product consumption in the Eastern Hemisphere would undoubtedly be affected by the availability of coal.

J. G. Trimmer suggested that the increasing use of fuel oil in industry might well mean that the oil industry would become more vulnerable than it had been in the past to changes in industrial activity. A considerable part of the expansion of industrial activity in the Eastern Hemisphere since the war had, in broad terms, been geared to oil, mainly because of a shortage in coal supplies. So long as economic activity in the Eastern Hemisphere continued to increase, the proportion of fuel oil might continue to rise but a decline in the momentum of the upward trend of general activity could well have the effect of restricting the outlets for fuel oil quite considerably.

N. L. Skilling raised the question of piping natural gas from the Middle East to Europe. While this project remained little more than a tentative proposal its possible impact ought to be considered, particularly on the demand for fuel oil in Europe.

Mr Hubbard then dealt with a number of points which had been raised in the general discussion. On the question of price he made the point that he did not think anybody could be sure how prices would move in the long run. Taking the world as a whole, the law of supply and demand still ruled. In the oil industry there was a curious set-up whereby supply and demand in the United States largely controlled the price structure throughout the world. Whether that would continue or not was

entirely outside the realms of any guessing on his part. Would energy requirements go on rising? Mr Hubbard thought that Mr Chilvers made a very good point that energy requirements do not rise as rapidly as industrial output; there seemed to be an improvement of about 0·8 per cent in the efficiency of utilization of energy in Europe each year, but, despite this, total energy requirements had been rising by at least 4 per cent p.a. Could coal production keep rising? Mr Hubbard was not in a position to forecast for the coal industry, but from what one read, he thought one might have suspicions that coal production would not keep in step with requirements. What will the industrialist do if he can't get coal? Is he going to shut down or is he going to change over to oil? Mr Hubbard did not know, but he doubted if the question of price structure, as known today, was the really relevant factor. It would sort itself out by the law of supply and demand, coupled with the extreme anxiousness of every country and every government to have a rising standard of living. If there was not enough coal, the price would adjust itself to the point that it would be attractive for the industry to produce more heavy oils.

Mr Hubbard went on to say that cyclical changes were important and would cause difficulties in so far as this large and, over the years, rising demand for heavier oils would inevitably be much more subject to short-term ups and downs. Coal output would be expected to remain more or less steady, if only because the full employment of miners would be a major political factor in every country. Therefore the coal would be produced on a regular level regardless of whether we had cold winters or hot, industrial recession or spurt. This would lead to an exaggerated variation in the demand for heavy oils.

With regard to a question about the position in 1953, Mr Hubbard said we had as yet no figures for the Eastern Hemisphere as a whole, but the heavy to light ratio in this country was definitely higher than it was in 1952. The growth in heavy oils was materially higher than the growth in motor spirit consumption. With regard to fiscal policy; this was, of course, a very important matter, but it could not have a very rapid effect. Even if the tax on motor fuels were reduced very considerably tomorrow, its effect on consumption would not really begin to be material for some years. Optional users, the private motorists, might be influenced by the retail price of petrol, but their consumption was small. It was only by a swing towards more and more road transport, which takes time to build and heavy capital investment, that consumption would respond to lower taxation.

Mr Hubbard's last point was the question of a natural gas pipeline from the Middle East. This was just possible from the engineering point of view. But there were some very serious snags in going through a very large number of different countries —each country would want to have certain advantages and certain free supplies. Although the biggest pipeline which could be built today might take in the heat equivalent of approximately 8,000,000 tons of crude at its starting-point in the Middle East, Mr Hubbard said he would rather not guess how much would be available at the delivery end.

P. M. de Veulle proposed a vote of thanks to Mr Hubbard for the excellent introduction and for the frank way in which he dealt with the questions raised in discussion.

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IP Students' Section Dinner

About 160 members and guests of the Birmingham University Chemical Engineering Society and Student Section of the Institute of Petroleum were present at their Seventh Annual Dinner on 16 March under the chairmanship of J. M. Davis, chairman of the Society. Incidentally, it is not out of place to mention that this Society originated in 1923 as the Birmingham Branch of the Students' Section, and thus has been in existence for over thirty years.

Principal guest at the dinner was Sir Harold Hartley, K.C.V.O., president-designate of the Institution of Chemical Engineers, and many representatives of the petroleum and chemical industries were among the company.

The Chemical Engineer and the Community

In proposing the toast of the Chemical Engineer and the Community Professor Garner said: At previous dinners of the Chemical Engineering Society we have had a variety of toasts—of the Midland Industries, the Petroleum Industry, Scientific and Industrial Research, Chemical Engineering Plant in Industry, Technology in Industry, and the Fuel Industries. It is only in the seventh that we bring ourselves so prominently into the foreground, perhaps a sign of modesty in that exuberant individual, the chemical engineer.

We welcome the establishment of chairs of chemical engineering at Durham and Nottingham and hope to see more chairs established in the near future. The reason for this is largely because of our own faith in the chemical engineer and our conviction that for the good of this country we require many more chemical engineers well trained in their subject and with the broad outlook which will, we hope, be associated with this form of academic discipline. J. S. Mill said that the study of science teaches young men to think and classics to express thought,

At the Birmingham Students' Dinner: (1) left to right: *Prof F. H. Garner, Dr. D. Clayton* (I.C.I., Billingham) (in background), *G. LeB. Diamond* (West Midlands Gas Board), *Sir Harold Hartley, and J. M. Davis* (chairman); (2) *a general view of the assembled company; and* (3) *Dr T. K. Ross* (Birmingham University), *W. E. Aylwin* (Midland Tar Distillers Ltd.), *Dr A. Parker* (Fuel Research Station), *and Dr R. Long* (Birmingham University).

and the chemical engineer has continuously impressed on him the importance of clear expression, which involves a good knowledge of the world around him and of the importance of human relations.

In introducing Sir Harold Hartley, Professor Garner referred to the many spheres in which Sir Harold Hartley had excelled and in particular to the work he had done in bringing the need of the country for chemical engineers to the attention of the Government, industry, and the university.

Sir Harold Hartley, referring to the varied qualifications of the chemical engineer *vis-à-vis* the now "extinct animal" the chemical technologist, said that the former was a co-ordinator in his own field. He was a well-educated engineer, as he was trained in the fundamentals of physics, chemistry, and engineering theory and the mathematical techniques which made it possible to apply these fundamentals to the new problems they would meet in industry.

It was fortunate for Great Britain, said Sir Harold, that it had chemical engineers to perform the important tasks which would fall to them. In the last twenty-five years, industry had had two main trends. The first was toward better processing of raw materials and the second a demand for higher quality. Processing was involved not only in the petroleum and chemical industries but over a wide range of other industries, and throughout depended upon the skill and work of the chemical engineer.

Concluding, Sir Harold stressed the need for them to have a good understanding of human nature, a factor which often meant the difference between success and failure.

The Society

E. J. Dunstan (Manchester Oil Refinery Ltd.), proposing the toast, reminded them that the graduate, when leaving the university, had 50 per cent enthusiasm, 40 per cent fundamental knowledge, and 10 per cent simple know-how. After a period in industry, the enthusiasm would remain, the know-how would have increased to 40 per cent, and the fundamental knowledge would have dropped to 10 per cent.

The only means they had of keeping in touch with developments in their art was by maintaining an interest in their societies and professional bodies. Concluding, Mr Dunstan said it was the role of the societies to carry them further than was possible by any other means available today.

J. M. Davis, chairman of the Society, thanking them for the acceptance of the toast said that the Society had three main activities. First, in the academic field, they had heard addresses on subjects varying from finance in industry to the cause and prevention of corrosion, while the Students' Competition had produced discourses on many matters from nuclear fission to witchcraft. They had also organized visits to works and factories and their magazine had continued to flourish. Secondly, in the athletic sphere, they had won the Inter-Faculty Sports League Cup, and their third activity—social events—had had some conspicuous successes. All these achievements had been due to the team spirit which prevailed throughout and to the continued support which they received from Professors Garner and Morton and from the staff.

He also referred to the new buildings for the department, which it was hoped would be opened in about two years time. This extension, it was anticipated, would increase the student strength to about 200 and make the department second in size to the chemistry department.

The Guests

The toast of "The Guests" was proposed by J. S. R. Morris, junior treasurer of the Society. He entertained the "distinguished gathering" with an amusing and interesting welcome to the guests. During his dissertation he referred to the changing population of the university. Some, he said, came direct from school, some from industry, some from completion of national service, and—the *rara avis*—some had completed everything except his education.

T. M. Fraser (Courtaulds Ltd.), thanking the Society on behalf of his fellow guests, said that the prosperity of the nation depended upon those of them who graduated into industry. The achievement of maximum productivity per man was the result of the application of scientific knowledge in the industrial field. The key word was application. The first step was to obtain reliable data, which was generally more difficult in industry than in the university. In the second step, which was to work out some solution, the main aim in industry was to get the right answer, whereas in the university it was most necessary to understand the principle. Thirdly, there was the problem of getting something done, which was the most difficult to solve in modern industry, as no one man could have sufficient specialized knowledge to cover the whole of an industrial scheme. The team spirit was therefore essential and the key to the successful application of the latter lay in an attitude of mind. With interest and enthusiasm the chemical engineer could do much to stimulate the right approach.

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Petroleum in Parliament

Gas Production

On 26 February the Minister of Fuel and Power was asked what applications he had received for allocation of foreign currency for the purchase of butane-air plants as an alternative to gas manufacture in Wales; what reports he had received on the success of this development; and what further experiments with this supply he intends to conduct in rural Wales.

In reply, the Minister said that the Wales Gas Board had received licences to import three such plants from the U.S.A. and had also imported one from France. He understood that the plants had proved satisfactory so far, and the Board was now considering the installation of additional plants, and experimenting with the use of propane in place of butane.

BEA Fuel Consumption

In reply to a question on 15 March, the Parliamentary Secretary to the Ministry of Fuel and Power gave figures, expressed as percentages, showing the increase in coal and oil used by the British Electricity Authority and the North of Scotland Hydro-Electric Board in January, 1954, over January, 1953. The figures given were 3.7 per cent increase in coal and 56 per cent in oil.

The Parliamentary Secretary was then asked to account for the great proportional increase in the use of oil during this period compared with the increase in the use of coal.

In answer, Mr Joynson-Hicks explained that he thought it was because of the small quantity of oil consumed. The total amount of oil used by the power stations was, he said, less than 1 per cent of their total fuel consumption.

Oil-Burning Power Station

The efficacy of gas-washing plant at the oil-burning Bankside power station came under discussion in the House on 16 March when the Minister of Housing and Local Government was asked whether he was aware that the gas-washing plant had the effect of bringing down more sulphur fumes than if it had never been installed.

Mr Marples replied that there was a technical conflict on that point and that tests had shown that the average efficiency of the extraction of sulphur and other gases was 97.2 per cent for the period between July and September, 1953, and 97.7 per cent between October and December, 1953.

Around the Branches

FAWLEY, LONDON, NORTHERN, PERSIAN GULF, SCOTTISH, SOUTH EASTERN, SOUTH WALES, STANLOW, TRINIDAD

Birmingham Student Branch

Recent activities of the Birmingham Student Branch have included the annual dance, held this year in the Students' Union on 12 Feb. The theme for decoration was continental, the centre-piece being the Eiffel Tower. There was a high attendance of 500 and the dance was reported by the student newspaper as one of the best society dances of the year.

A discussion was held on 26 January on the motion that "This meeting considers the chemical engineering curriculum to be in need of reformation". The main points brought out by the speakers for the motion were the need to extend the minimum duration of the course to 4 years, and the need to encourage firms which arrange vacation courses to set students definite problems to tackle. There was also some support for the introduction of chemical engineering principles earlier in the course. Against the motion, opinions expressed were to the effect that the present course formed a sound basis on which the student himself could build.

Fawley Branch

At a meeting of the Branch on 19 February, B. H. Gibbs spoke on "Pumps, their Design, Manufacture, and Application".

Mr Gibbs began by drawing a parallel between the human body and a typical complex chemical plant and indicated how in both instances various kinds of pumps were essential to keep the processes going. He said that since centrifugal pumps represented by far the largest number of applications in modern process plants he would deal exclusively with this type. Centrifugal pumps had been in use for a considerable while for pumping water, but when such pumps were applied to a wide variety of chemical processes they were found to have certain fundamental disadvantages. In particular it was difficult to ensure that they would take suction when dealing with liquids at or near their boiling-point, and they were generally unsuitable mechanically for hot or highly viscous liquids. It soon became a matter of necessity to design a series of pumps which would cover the whole range of conditions generally met within process plants with a minimum of different designs and with special attention paid to the following features:—mechanical reliability; ability to work with very low net positive suction heads; a minimum number of stages for a given duty—hence the highest practical head per stage; ease of maintenance and replacement of parts.

The hydraulic considerations governing the design of these process pumps, *i.e.*, high head per stage and low NPSH requirements, were achieved by careful attention to the design of the impeller, and in particular the provision of very generous suction passages in both impeller and casing. These new pumps could obtain heads up to about 450 ft at synchronous speeds of 3000 r.p.m. and 600 ft at 3600 r.p.m.

Mr Gibbs explained the meaning of NPSH by showing how the liquid must have a certain amount of pressure above its vapour pressure in order to allow for the changes in static head due to losses and increase in both axial and circumferential velocity as the liquid enters the impeller. Most process pumps can accept a small amount of air or vapour in the liquid being pumped, but vapour formation in the eye of the impeller, due to the suction head being too low, causes rapid falling off in performance at high flows. It was also shown how the typical characteristic curve is obtained from theoretical considerations of the velocity triangles in the impeller outlet, and how careful consideration is given by pump manufacturers to the achievement of a continuously falling characteristic with flow increase. Pumps which have a rising characteristic at low flows will not parallel, neither in some instances can effective flow control be obtained.

To achieve reliability under a wide range of temperature conditions, the mechanical design of the pumps has been firmly established on certain basic principles; in particular, pumps for hot service are usually mounted on rigid lugs resting on stools on either side of the pump rising to the centre line, thus obviating the misalignment with the driver which would result from the pump being mounted from underneath. Also, special fits and very close tolerances were specified in order to obviate the taking up of clearances when hot, or distortion of parts such as gland sleeves due to differences in temperature between the impeller, shaft, and casing. Most of the modern process pumps were designed with spacer-type flexible couplings which would cope with misalignment, and also permit endwise dismantling of the pump internals without disturbing the outer casing or the pipework connexions.

The provision of stuffing boxes, and the necessity to prevent wasteful and possibly dangerous leakage was a very important matter. Pumps were generally designed to have only one stuffing box where possible, and also to have suction pressure on the stuffing box except where the suction is below atmospheric pressure, when special steps are taken to ensure that a slight positive pressure is imposed on the stuffing box to prevent the inward leakage of air.

Mr Gibbs concluded by showing a number of slides of typical process pumps for a wide range of duties, single and two-stage, single and double suction types which illustrated many of the features he had described, and showed a very interesting film dealing with the manufacture of pumps.

London Branch

At a meeting of the London Branch, held at Manson House on 17 February, O. M. Alexander gave a talk on "This Detergent Age".

Despite all the research which detergent manufacturers devoted to improving their products, it was the housewife, explained the speaker, who was the final judge. She was consulted at every development stage of all new products, both soap and detergents, and she had taught the industry that only the best was good enough. With unfailing accuracy the housewife could pick the best from a group of detergents and, though her choice often baffled the chemists, in the end she was always vindicated.

The development of the detergent industry, said Mr Alexander, had been of benefit to mankind because of the saving in fats which would otherwise have been consumed in soaps. In 1944 the U.S.A. used 1,800,000 tons of soap and 56,000 tons of new detergents, but by 1953 the figures had become 920,000 tons of detergents and 800,000 tons of soap. This illustrated the enormous growth in the use of the new detergents. In practice the revolution was even greater than the figures showed because one ton of the better new detergents, under certain conditions, did as much washing as nearly 1½ tons of an equivalent soap.

Experience in this country was closely parallel to that of the U.S.A., and the new detergents had now reached a proportion of about 45 per cent of the total washing material market.

Emphasizing the savings in food products effected by the introduction of the new detergents, Mr Alexander stated that if they were all replaced by soap, an extra 100,000 tons of oils and fats would be required. This was about 7 per cent of the total oils and fats, including butter, available in Britain today

What the Editor's camera saw at the London Branch Fork Supper. (1) *A general view in the bar;* (2) *some indulged in coffee after supper;* (3) *the chairman, Alan Deller* (left) *with Mr and Mrs Jim Porter;* (4) *an Esso group—A. Osborn, H. L. West, Norman Skilling* (in background), *A. E. Makins, Bill Byrom, Phillip Barrett* (British Celanese), *and Alec Mauchan; and—*

and represented about three-quarters of a million acres of oilseed crops. But for the saving made by the new detergents it was extremely unlikely that there could have been the announcement of derationing of edible fats on 8 May.

Mr Alexander explained that the original detergents were made by sulphating fatty alcohols or fatty monoglycerides, and were known as "light" detergents, that is, they were of use only when dirt was lightly attached. A secondary alkyl sulphate derived from refinery wax was an important member of this group.

The heavy duty type of detergent originated in the U.S.A. where the chosen active base material was aklyl benzene. This was a material particularly well-suited for the petroleum industry to make for, after the war, a lot of alkylation capacity was available. The alkyl benzenes were made partly from kerosine and benzene, and partly from a polypropylene polymer (4 molecules of propylene) and benzene. The latter had proved the most popular. Detergent manufacturers bought these alkyl benzenes, and sulphonated and neutralized them. A really good detergent was then made by adding a complex phosphate such as sodium tripolyphosphate, while various other chemicals were included to give special properties. One of these was sodium perborate to liberate oxygen.

Two films were shown during the talk, one called *New Detergents* and the other *Detergent Studies*. A vote of thanks was then proposed by G. H. Cullinan.

London Branch Fork Supper

On Tuesday, 17 February, the London Branch held its annual fork supper and a large number of members with their wives and friends met to enjoy this informal occasion. Unfortunately, the President was unavoidably prevented from attending by other pressing business.

As in previous years a bar was provided and this proved a popular meeting ground for the exchange of news and views. When guests, replete with food and wine felt a need to rest, they repaired to the lecture hall where a film show was in progress. Films shown included *Frost, Desert Locust, Ocean Terminal* and *Shell Cinemagazine No* 15.

As the photographs show, this was a very happy meeting of members and friends, and it is clear that the fork supper is now a firmly established social event in the Branch calendar.

Northern Branch

The full list of officers for the coming year, elected at a committee meeting on 16 March, is as follows: chairman, J. C. Wood-Mallock; deputy chairman, T. G. Provest; secretary, G. M. Davies; and treasurer, E. R. Wilson. Following the resignation of G. A. Parry, H. Stillman has been elected to occupy the vacancy on the committee.

It was unanimously agreed that H. H. Ballard should be *ex-officio* member of the council for the year 1954-5.

At the branch meeting on 16 March, G. Frost presented a paper entitled "Emulsions and Emulsifying Agents" which produced a great deal of discussion.

A vote of thanks was proposed by J. E. Haslam.

Scottish Branch

A meeting of the branch was held on 11 March at which Dr H. B. Nisbet presided in the absence of the chairman, J. M. Caldwell.

At a committee meeting before the ordinary meeting the following officers were appointed for the coming year: chairman, J. M. Caldwell; vice-chairman, Dr H. B. Nisbet; secretary, W. Stirling; treasurer, Dr G. H. Smith; and recorder, Dr W. B. Peutherer.

The meeting was addressed by J. R. Bolter whose subject was "Some Problems and Applications of the Industrial Gas Turbine". Mr Bolter said that the gas turbine had been known in principle for many years, but it was not until comparatively recently that the necessary aerodynamic and metallurgical knowledge to build a practicable gas turbine was available. The reason for the high degree of knowledge required was that the useful output of the gas turbine was the difference between two large quantities, the turbine output and the work absorbed by the compressor. Unless high turbine and compressor efficiencies were attained, and a high turbine inlet temperature could be used, the power output would be small and the machine inefficient.

—(5) *Buffet supper in progress, with the chairman making merry with the salad cream;* (6) *A. J. Goodfellow, Ron Leach, the hard-working honorary secretary of the Branch, and Peter Gibson;* (7) *Norman Skilling, Peter Gibson, Ron Leach, A. F. Fulford, and W. E. Hewett; and* (8) *Alan Bridgewater drinks the health of Mrs Price, Mrs Deller, and Mrs Bridgewater.*

Mr Bolter said that with present-day efficiencies, and turbine temperatures practicable for industrial uses, the thermal efficiency obtained by the simple open-cycle gas turbine without heat exchanger was limited to some 20 per cent. This figure could be raised to about 30 per cent by the use of heat exchange, intercooling, and reheat, but these developments took away many of the advantages of the simple machine.

Mr Bolter went on to say that the gas turbine would burn, with an adequate degree of reliability, distillate oils and gaseous fuels such as natural gas, producer gas, blast furnace gas, and sewage gas. Research was going on, with some degree of success, into the burning of heavy oil, coal, peat, slurry, and firedamp.

South Wales Branch

The seventh meeting of the branch was held on 4 March, 1954 under the chairmanship of J. A. Green, when W. Jamieson of the Anglo-Iranian Oil Co. Ltd. spoke on "The Oil Industry in World Economy".

Mr Jamieson opened his talk by referring to the fact that "oil" is purchased mainly to provide heat or energy, and that man's constant search for machines to do his work calls for greater and greater amounts of fuel. He then briefly discussed methods of handling and using the two main fuels—coal and oil.

A table expressing world energy requirements in terms of tons of hard oil was discussed with particular reference to water power, natural gas, oil, and coal. Attention was drawn to the fact that one ton of diesel fuel was equivalent to ten tons of coal when used for rail traction.

Mr Jamieson then discussed related matters of price structure (based on Gulf Coast figures) markets, supply and demand, type of plant, and the influence of these on the proportion of products obtainable from a particular crude oil. Comparing coal and oil production and reserves, he dealt with the world's main producing and consuming areas, the largest producer being the U.S.A., which was a marginal exporter, the Caribbean being a major exporter, and the Middle East an exporter roughly equivalent to the consuming area of Western Europe. Reference was also made to the growing production in Canada.

After dealing, in a general way, with the transport problems involved in moving oil from the production centres to the consuming areas, Mr Jamieson answered a number of questions raised by the audience.

A vote of thanks to the speaker was proposed by C. E. Jones.

Trinidad Branch

The newly-elected branch chairman, Dr A. L. Down, presided at the 132nd general meeting, held at Apex Club on 19 February. The meeting was well attended by members and guests.

A discussion on "Oil-Well Pumping" was prefaced by notes presented by a panel of three. R. Pike of Trinidad Leaseholds Ltd. reviewed some of the many problems associated with production in Trinidad, by artificial lift and pumping in particular, and raised an interesting query as to whether these problems were being viewed in their proper perspective.

H. C. Costelloe, of Apex (Trinidad) Oilfields Ltd., read a note on the tailoring of well-pumping installations and stressed the difficulties involved in reducing the pump volumetric capacity of the installation to meet the low production rate requirements of the average Trinidad well. Well-pumping calculations recommended in the light of experience were presented.

H. Blankestijn of United British Oilfields of Trinidad Ltd. described experiments carried out to increase the rate of fall of pump plungers and sucker rods in wells producing high-viscosity crudes, and also dealt with modifications to standard type pump-plungers, the use of a stepped-diameter plunger, and methods to determine the length of the plunger stroke.

A lively discussion followed and the meeting ended with a vote of thanks to the speakers moved by W. Andrews.

THE VOICE OF THE PAST

Patents We Think Must Have Lapsed

A method suggested for extinguishing oils on fire is the placing amidst the flames of a fine meshed wire net—almost instantly cools the oil sufficiently to extinguish the flame. *Petroleum Review*, 1899.

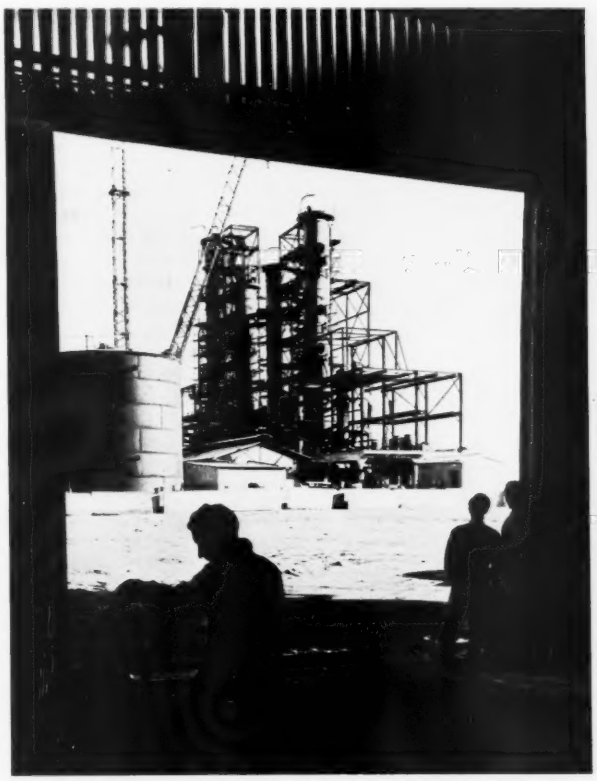
The Crystal Ball

Petroleum as Fuel for the Navy

"In spite of the adverse decision of the official in regard to the adoption of this fuel, I felt compelled to order a repetition of the trials under officers not prejudiced by tradition." (Commodore G. W. Melville, 1899).

Geelong Refinery

On 18 March Field-Marshal Sir William Slim, Governor-General of Australia, opened Shell's new Geelong refinery, one of the largest and most modern of the Australian refineries now being constructed by the oil industry. Geelong is the first of these new refineries to come "on stream".



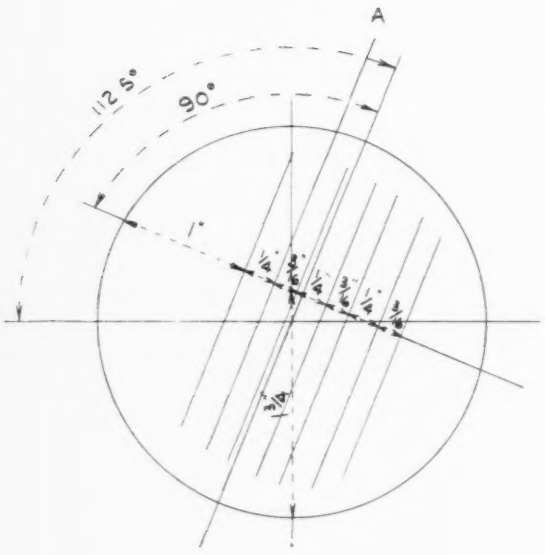
A Shell photo

Distillation Unit at the Geelong refinery, Australia.

The first stage of construction at Geelong consists of a crude distillation unit, with a capacity of 1,800,000 tons a year, and ancillary treating facilities. A catalytic cracking unit, scheduled for completion by the middle of 1955, will have an intake capacity of 650,000 tons p.a., and is designed to convert heavy oil fractions to motor spirit.

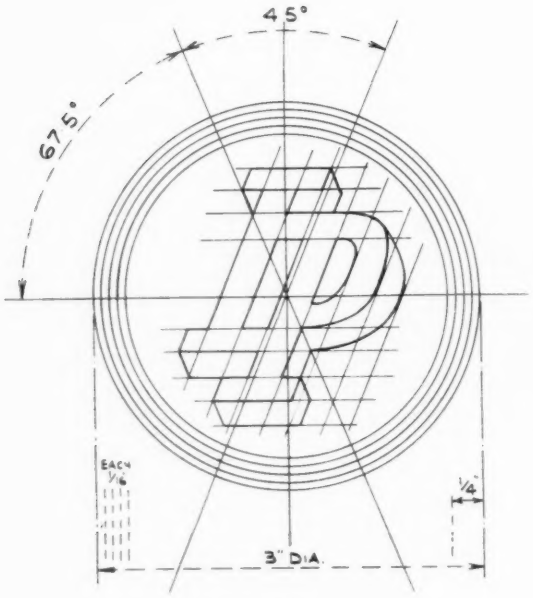
It is at present intended that crude oil for the refinery should come from the Middle East and the Seria oilfield in British Borneo.

A Quick Method for Drawing the IP Monogram



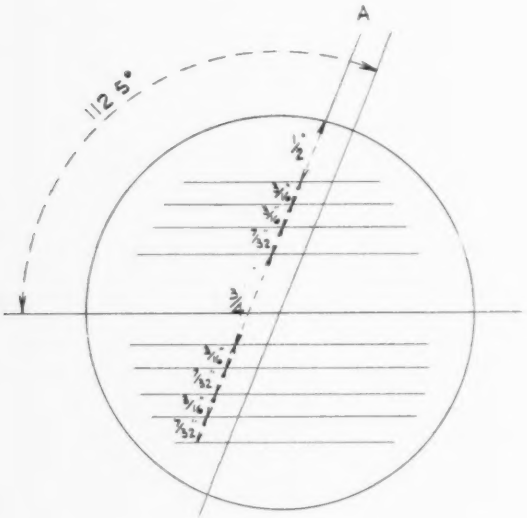
Stage 1

Draw (1) Outer circle (3-inch dia. used in original).
(2) Horizontal and vertical lines through centre of circle.
(3) Line at 112·5° through centre.
(4) Line at 90° to (3) $1\frac{1}{4}$ inch as shown along vertical.
(5) Mark off along (4) as shown and draw parallels to (3).



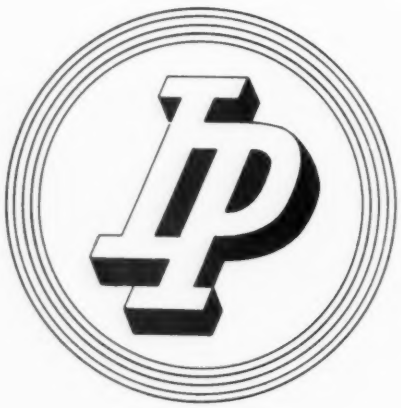
Stage 3

Draw (1) Line at 67·5° through centre of circle.
(2) Lines parallel to (1) as shown.
(3) Four inner circles as shown.



Stage 2

(1) Mark along A as shown.
(2) Draw horizontal lines.



Finished drawing. J.S.P.

Chemical Engineering

PART X—FILTRATION

By D. C. FRESHWATER

Solid matter suspended in a liquid may be removed by causing the liquid to flow through a porous medium which retains the suspended solid. This technique, which is called filtration, is one of a whole series of operations for the separation of mixtures of solids and liquids, or solids and gases, by purely mechanical means. However, it is such a common and widely used method that it is generally considered as a separate unit operation.

In petroleum refining, filtration invariably accompanies percolation or contact treatment by absorbents in order to remove the adsorbent from the treated oil. Another example of its application is the removal of crystallized waxes from lubricating oils.

Filtration Theory

When a liquid flows through a porous bed (the filter medium) there is a resistance to the flow, which is shown by the pressure drop across the filter. When the liquid contains solids, this resistance increases as more and more of the solid particles are collected on the filtering surface and increase the depth of the bed through which the liquid flows. Thus we have the usual concept of a flow opposed by a resistance and overcome by a driving force. In common with other unit operations in which this concept appears, the major point of interest in practice is the rate of flow, and this may be expressed as

$$dV/d\theta = KA\triangle P/R$$

where V is the volume of filtrate (*i.e.*, clear liquid) collected in time, θ, across a unit area, A, $\triangle P$ is the pressure drop across the filter, R is the resistance to flow, and K is a proportionality constant.

The main problem in filtration is to determine the values of R and K. In practice, the resistance of the filtering medium itself is small compared with the resistance of the bed of solid particles which gradually builds up. Consider first a filtration process in which the liquid is flowing through a bed of thickness L. The earliest attempts to explain filtration quantitatively were based on the assumption that the liquid passages through the filter bed were bundles of capillary tubes and that the flow of liquid was governed therefore by Poiseulle's law for viscous flow through a capillary tube. However, apart from introducing into the equation a term, μ, to include the liquid viscosity (an obvious factor) this method of attack did not lead to satisfactory results. The reason is that the liquid passages are of a complex shape not always the length of the bed thickness L. Moreover, only part of the unit area, A, is available for flow, the fraction depending upon the permeability or porosity of the filter bed. Thus it was suggested by Kozeny that the significant property of the bed was the actual surface in contact with the fluid. This ratio of surface area to unit volume of pore space is analogous to the hydraulic radius of fluid mechanics, and is generally expressed in terms of the specific surface of solid, S, and the bed porosity, e. The equivalent hydraulic radius or wetted perimeter of the fluid passages in the bed is then $S(1-e)/e$, whilst the actual fraction of unit area available for liquid flow is Ae instead of A.

The rate equation thus becomes

$$V/\theta = K\triangle PAe^3/LS^2(1-e)^2$$

The hydraulic radius term is squared because the frictional resistance to flow is proportional to interfacial area of contact between liquid and solid.

This equation can be written more simply as

$$V/\theta = K^1\triangle PA/\mu L$$

where $K^1 = Ke^3/(S^2(1-e)^2)$

It should be noted that e and S are properties of a collection of solid particles that can be measured by direct observation.

The actual depth of the bed is increasing continuously during filtration as more and more solid is deposited on the filter medium. It is convenient, therefore, to rewrite L in terms of the volume of porous bed, b, deposited by a unit volume of filtrate over a unit area. Thus L becomes Vb/A, and the rate of filtration is then expressed as

$$V/\theta = K^1\triangle PA^2/\mu Vb$$

However, it is still incomplete because no allowance has been made for the resistance of the filter cloth and the pipes and valves which are connected to the actual filtering surface. It was Underwood who first drew attention to this extra resistance which must be taken into account. Let this new resistance be R, when the machine is operating with a filtrate of unit viscosity. Then in the general case, the resistance will be μR, where μ is the viscosity of the actual filtrate. The total of the two resistances in series is therefore

$$\mu R + \mu Vb/AK^1$$

$$\text{Thus } \frac{V}{\theta} = \frac{A^2\triangle P}{\mu AR + \frac{\mu Vb}{K^1}}$$

This may be rearranged as

$$\theta/V = \mu b/K^1A^2\triangle P \quad V + \mu AR/A^2\triangle P$$

This is the equation of a straight line of slope $\mu b/(K^1A^2\triangle P)$ and intercept $\mu AR/A^2\triangle P$. Thus experimental runs on a particular slurry at constant pressure drop may be plotted as θ/V against V, and give straight lines. This enables the value of K^1 to be found since all other terms are known or can easily be measured.

It is interesting to note that this equation may be used to determine the specific surface of a system of solid particles. A fluid of known properties is passed through a fixed thickness of bed at a measured rate, and the pressure drop is noted. Operation at different rates enables the value of K^1 to be found, and hence the specific surface S from the relation between the two variables noted earlier. This is the so-called permeability method often used for measuring the surface area of adsorbents, to which reference was made in Part IX of this series.

In the derivation of these equations it was stipulated that the porosity of the solid particles should remain constant. This is expressed by saying that the "cake" produced by filtration is incompressible. A truly incompressible cake is rarely, if ever, encountered in practice, but for very many cases of practical importance the bed or cake may be considered as incompressible without serious loss in accuracy. A treatment of the theory of compressible cakes is beyond the scope of this article.

Filters

Filtering machines may be classified into two main groups, according to whether their operation is batchwise or continuous. The former are easily the more numerous, and are also more varied in design, ranging from the simple sand and gravel box

used for water filtration to the fairly complex leaf filters such as the Vallez and Sweetland types. Another large group is the so-called plate and frame presses. Whilst this group is still used widely in chemical industries generally, it is no longer used to any

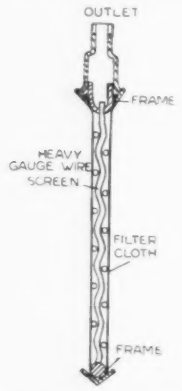


Fig 1. *Diagrammatic section through filter leaf.*

appreciable extent in the petroleum industry. Economic considerations have led to replacement by leaf filters which are typical of the batch filter most widely used in the petroleum industry at the present time.

Leaf Filters

This class of filters derives its name from the method used to support the filtering medium. Whilst there are several different types, the basic principle is the same in each, and is illustrated in Fig 1. A framework is made of heavy-gauge wire mesh, and

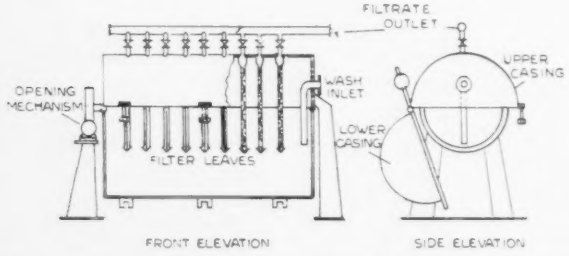


Fig 2. *Sweetland filter with casing open and part in section.*

suspended from an outlet pipe. This frame is covered by a filter cloth and then the complete assembly is immersed in the slurry which is to be filtered. The driving force may be vacuum applied to the outlet pipe, and hence to the inside of the cloth, or pressure applied to the slurry in an enclosed apparatus. In both, liquid is forced through the cloth, and the solids are deposited on the outside of the leaf. When a layer of sufficient thickness has been built up, the filter cake is washed either by removing it from the slurry and putting it into a second vessel containing the wash liquid, or more usually, by removing the remaining slurry and then pumping the wash liquid through the leaf *in situ*.

In petroleum refining, the latter procedure is more common since the filtrate is generally more valuable than the filter cake. After washing, the solids are removed from the leaf either by air blowing or by forcing water through the cake in the reverse direction. The whole cycle of operations may then be repeated.

The Sweetland filter is probably the most usual form employed in refineries. In this machine (see Fig 2) the leaves are circular and suspended by suitable top outlets in a cylindrical casing which is split longitudinally. The lower half of the casing is hinged to the upper, and may be opened and closed at will. During filtering and washing the cylinder is closed and filtration takes place under pressure. The container is opened to facilitate removal of the cake, and cleaning and maintenance of the leaves

Typical applications of these machines are in the contact treatment process for removal of spent clay, and in the separation of crystallized wax from lubricating oils.

Continuous Filters

These are exclusively of the rotary type, in which the filter medium is carried on a rotating drum, with the lower part submerged in the slurry. Generally, the driving force is atmospheric pressure, the space behind the filter cloth being maintained at a low absolute pressure. Positive pressure machines have been constructed, but they are much more expensive and are rarely used. We shall consider here the most common example of this type of machine, which is the rotary drum vacuum filter. Fig 3 shows a section through such a machine. The filter

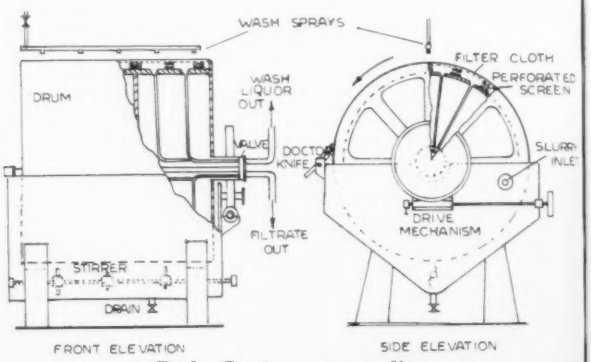


Fig 3. *Continuous rotary filter.*

cloth is carried on the cylindrical portion of the drum which is constructed of perforated plate. The drum itself is divided into a number of separate chambers by segmental partitions and each chamber is connected by a pipe to a rotary valve on the axle of the drum. By means of this valve the various chambers are subjected both to vacuum, whilst the appropriate section is immersed in the slurry, and to air pressure when the cake is being dried prior to removal. Generally, there are sprays above the drum for washing the cake, which is removed finally by means of a doctor knife parallel to the axis of the drum.

The filtrate and wash liquid are removed via the pipes connecting the chambers to the rotary valve. A diagram of this valve,

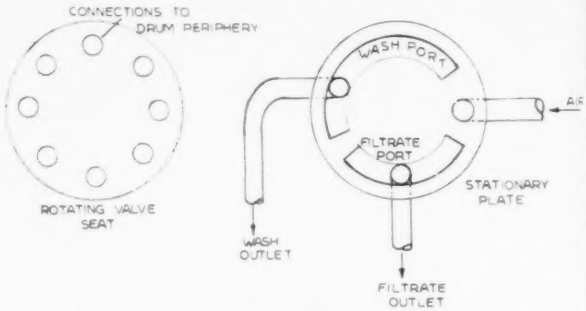


Fig 4. *Details of rotary valve for continuous filter.*

which has a rotating seat fixed to the drum and a stationary plate fixed to the frame, is shown in Fig 4.

The solids in the slurry under the drum may have a tendency to settle out, and so most filters of this type are provided with some sort of agitation to keep the particles in suspension. The speed of rotation of the drum is adjusted so that a filtering section remains submerged for a period sufficient to build up a cake of

the desired thickness (usually ¼-1 inch). The filtering of difficult slurries, which give highly compressible cakes, is made easier by adding small amounts of finely divided solids of some suitably porous material such as diatomaceous earth or kieselguhr. Such substances are known as filter aids, and may be used to precoat the filter cloth on a rotary filter before the filtration. This prevents very small particles in the slurry or slimy materials becoming entangled in the cloth, and making its resistance unduly high.

The rotary filter is particularly suitable where the volume of material to be handled is very large, the percentage of solids in suspension is high, and the labour costs must be kept low. In addition it has the advantage of being continuous in operation, and is tending to displace the older batch type machines in several fields.

In this necessarily brief review, only the main topics have been discussed. For further detail see:

Carman, P. C., *Trans. Instn. chem. Engrs.*, 1938, **16**, 168.
Field, H., *Prod. Engng.*, 1945, **16**, 409.
Dickey, G. D. and Bryden, C. L., "The Theory and Practice of Filtration", New York: Reinhold Publishing Corporation.

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Retirement of Robert Crichton

Robert Crichton, J.P., Hon. F.H-W.C., M.I.Min.E., F.Inst. Pet., managing director of Scottish Oils Ltd., retired on 31 March after 58 years service in the Scottish oil industry.

His service with James Ross & Co., Philpstoun Oil Works, started in 1896, when he entered the Company as an apprentice mining engineer. He obtained his Colliery Manager's Certificate (First Class) in 1905, and in 1907 was appointed mining manager and assistant to the managing director. Subsequently, in 1918, he became managing director.

Robert Crichton

In 1919 the existing six shale oil companies were brought under one management in a new company, Scottish Oils Ltd., a subsidiary of the Anglo-Persian (now Anglo-Iranian) Oil Co. In this new Company Mr Crichton held the position of general mining manager, and in 1928 was appointed to the Board of Directors. In 1930 he became general manager and director, and finally in 1941 managing director. He is a director also of British Petroleum Chemicals Ltd.

With all the responsibilities and anxieties of steering the shale industry through many troubled times, and of controlling Grangemouth refinery (which recently increased its capacity for crude oil to 2¼ million tons per year), Mr Crichton found time to take a deep interest in local government and the welfare of the community.

He was a member of the West Lothian County Council for 30 years and chairman for 10 years; chairman of West Lothian Unionist Association for 7 years, and since 1948 has been chairman of West Lothian (Bangour) Hospital Group Board of Management—a post he still holds.

He is intensely interested in technical education, and in this connexion served for 10 years as a governor of Heriot-Watt College, and from 1938 to date as a governor of the Royal Technical College, Glasgow. He is also a member of the Heriot-Watt College Central Mine Rescue Station Advisory Committee, and for some 25 years was a member of the Panel of Local Examiners of the Board for Mining Examinations. In 1952 he was made an Honorary Fellow of Heriot-Watt College.

The various scientific societies have had his full support and active interest. He is a Member of the Mining Institute of Scotland, an Associate of Mining, Electrical, and Mechanical Engineers and a Fellow of the Institute of Petroleum.

In the Institute of Petroleum, Robert Crichton has always taken a leading part in its affairs in Scotland. When it was decided to hold an Oil Shale and Cannel Coal Conference in Glasgow in 1938, it was only natural that he should be chosen as chairman of the organizing Committee. Similarly, when the second such Conference was held in 1950, the Organizing Committee was under his chairmanship. The success of the technical session and the social occasions of both conferences are remembered by all who were present and are a tribute to his organizing ability and his kindly character.

It was at the first Oil Shale and Cannel Coal Conference that the decision was made to form the Scottish Branch of the Institute, and here again there was no doubt as to choice of chairman —Robert Crichton. That chair he occupied with conspicuous success until he vacated it about a year ago.

In the managing directorship of Scottish Oils Ltd. Robert Crichton is succeeded by J. M. Caldwell, J.P., Hon. F.H-W.C., M.I.Min.E., M.Inst.Pet., who has also succeeded him as chairman of the IP Scottish Branch.

Robert Crichton being presented with gifts as tokens of his colleagues' esteem at a ceremony held at Uphall, West Lothian. Nearly 200 members of the staff of Scottish Oils Ltd. and Grangemouth Petroleum Refinery Ltd. were present, together with representatives of the Anglo-Iranian Oil Co.

The presentations were made by J. Spittal (left), *senior works manager of Scottish Oils Ltd., and J. M. Caldwell was in the chair.*

Personal Notes

Sayid Mohammed Abdul Ghani El-Naqib, director general of oil affairs in the Iraq Ministry of Economics, has been appointed by the Iraq Government to serve as a director on the boards of the Iraq, Basrah, and Mosul Petroleum Companies.

Sayid Mohammed el-Naqib studied at the American University of Beirut and at Birmingham University, where he took a degree in petroleum sciences. He was at one time the Government oil inspector at Kirkuk, centre of the Iraq Petroleum Company's oil production.

The new director will join H.R.H. the Emir Zaid, youngest brother of King Faisal I, who has represented the Iraq Government on the board of the Iraq Petroleum Company for the past twenty-five years.

J. D. Garst

J. D. Garst, formerly of the Texas Co. and the California Texas Oil Co., New York, has been appointed operations director of the Regent Oil Co. He will be responsible for the operations of the bulk storage and transport divisions of the Regent Oil Co.

O. H. Fish has been appointed assistant general sales manager of the Regent Oil Co. Mr Fish was formerly with the California Texas Oil Co., New York, and has had world-wide marketing experience in the petroleum industry.

C. D. Brewer, F.Inst.Pet., a Member of Council, recently joined the Ford Motor Co. Ltd., to take charge of all new design and development work in relation to gasoline and diesel engines, and is at present located in Birmingham. Previously he was for over twelve years with Shell at Thornton and built up the lubricating oil laboratory. At the time of leaving Thornton he was head of the heavy fuels research section. Mr Brewer has always been active in IP affairs and a paper of his was the first to appear in the *IP Review*.

S. E. Holmes, A.R.I.C., A.F.Inst.Pet., of C. C. Wakefield & Co. Ltd., has been appointed manager of the Company's department for technical information. The department forms part of the technical services of the Wakefield Group under G. H. Thornley, group technical manager. Mr Holmes joined Wakefields in 1931 and was, for a number of years, an analytical chemist in their laboratories at Hayes. He also represented the company on the Inorganic Analysis Panel of the IP. In 1949 he became chief assistant to G. H. Thornley.

H. M. White, who joined the department for technical information at C. C. Wakefield & Co. Ltd. in 1950, has been appointed assistant manager of the department.

Dr Gustav Egloff, director of research, Universal Oil Products Co., Illinois, has been awarded the 1954 Carl-Engler-Medaille, Germany's highest award in the field of mineral oil science.

Dr Egloff, who is the first scientist living outside Germany to receive the award, will be presented with the medal during the annual congress of the German Institute of Petroleum and Coal. He will address the congress on "Chemistry in the Modern Oil Industry".

F. N. Judson, who is general sales manager responsible for industrial marketing, Vacuum Oil Co. Ltd., has just completed 40 years service with the Company. Four years of Mr Judson's career were spent with Vacuum Oil Co. Inc., New York, as assistant general manager in China. He returned to Britain in 1929, and took up his present position in 1952.

Russell M. Brown has been appointed general manager of the Refining Division of the California Texas Oil Company, Ltd., a position in which he will co-ordinate the work of the many refineries in which Caltex has an interest.

Mr Brown's last overseas position was that of general manager and vice-president of the Bahrain Petroleum Company Ltd. at the Bahrain refinery. After 16 years service in the Middle East, Mr Brown was awarded the honorary Order of the British Empire in recognition of the outstanding services rendered to British official interests while employed in Bahrain.

Dr Kenneth G. Mackenzie, F.Inst.Pet., has retired from The Texas Company and has opened offices at Old Hill Farms Road, Westport, Connecticut.

J. R. Keith has been appointed assistant general manager of the Refining Division of the California Texas Oil Company, Ltd. (Caltex). Mr Keith's new position in the Company's head office in New York is the latest step in almost 25 years of refining, research, and administrative experience. Mr Keith joined the Texas Company in 1929 and was transferred to Caltex in 1937.

The 1951 winner of the Australian Mobil Quest, Miss Margaret Nisbett, was the guest of the Vacuum Oil Co. at a cocktail party in London recently.

The purpose of the Mobil Quest, which is organized in Australia by the Vacuum Oil Co. Pty. Ltd., is to discover new talent among singers, to encourage artists and assist them in their careers, and to create greater appreciation of good music in Australia.

In this photograph Miss Nisbett is seen with her husband John Wearing (right), *a semi-finalist in the competition, and J. C. Gridley, chairman of the Vacuum Oil Co.*

Books and Films

Farming Methods—1954

Recent developments in grain drying and modern methods of rearing young turkeys are shown in the new colour film, *Farming Methods*—1954, issued by Shell-Mex and B.P. Ltd.

The first part of the film shows how waste heat from a tractor engine can be used to dry grain in a ventilated silo. A tractor engine is used to drive the ventilation fan and the waste heat is

trapped by a housing and ducted away to dry the grain. Temperature control is achieved by a baffle incorporated in the housing structure.

The second part of this film illustrates the necessity for scientific methods of feeding and management in the rearing of day-old turkeys. A farmer visits two large-scale turkey farms before starting out on a venture of his own to rear one hundred turkey poults for the Christmas trade, in addition to his normal farm work. Scientific breeding methods are shown and also the way in which the farmer applies these techniques to rear his turkeys.

Production Improvement

A New Approach to Production Improvement is the title of a documentary film issued by the Industrial Division of Philips Electrical Ltd. The film draws attention to the work of the Philips Industrial Application Centre in London, and illustrates the many ways in which electrical equipment can be used in industry to speed and improve production.

The film is suitable for both technical and lay audiences, and copies can be obtained on loan free of charge to engineering societies, technical colleges, industrial undertakings, etc. Enquiries should be addressed to: Industrial Application Centre, Philips Electrical Ltd., 122 Brixton Hill, London, S.W.

Stainless Steel in Power Production

The use of stainless steels in the production of power plants is very well illustrated in a 31-minute colour film on 16 mm. Kodachrome stock which is now available on loan from Firth-Vickers Stainless Steels Ltd., Staybrite Works, Sheffield 9. This film shows various details in the manufacture of hydro-electric plant, turbines, gasoline, diesel, and jet engines, and includes some shots of the gas turbine in the tanker *Auris*.

An interesting film on *Farnborough* 1953 is also available from the same source.

Safety Code for Highly Inflammable Liquids

Recent developments in petroleum chemistry have resulted in the production on a commercial scale of liquids which although highly inflammable, are not covered by the transport and storage regulations of the Petroleum (Consolidation) Act, 1928.

Recognizing the need for precautions in the handling and use of a number of these substances, ABCM has compiled a special "Code for the Storage and Use of Highly Inflammable Liquids", which has been based to a large extent on the Regulations of the 1928 Act, and in some instances goes beyond these requirements.

The code has been drafted with the assistance of both large and small companies with special experience in this field, and there has been close contact with the Government departments concerned and the IP in the production of the Code.

Copies can be obtained from ABCM, Cecil Chambers, 86 Strand, London, W.C.2. Price 2s, post free, cash with order.

DSIR Booklet

A new brochure, "Research at Your Service", has been published by the Department of Scientific and Industrial Research to draw attention to the services which the Department offers to industry.

An outline is given of the work carried out in the Department's fourteen research laboratories, and the work of some forty research associations is also summarized. These associations are particularly valuable in that they have been set up voluntarily by groups of firms to study their common technical problems.

Copies of the brochure can be obtained from DSIR, Charles House, 5-11 Regent Street, London, S.W.1.

World Road Statistics

A valuable compilation of statistical information on roads, road vehicles, and fuel and vehicle taxation is contained in the 2nd edition of "World Road Statistics", obtainable from the International Road Federation Ltd., 18 South Street, London, W.1 (price 12s. 6d. post free).

Its 122 pages are full of useful data, and in particular Table VI sets out details of taxation on road vehicle fuels and on vehicles for every country. Other tables deal with the numbers and density of motor vehicles (January 1952), the total revenue from taxation (1950), expenditure on roads (1950). The taxation details in general relate to the beginning of 1953 and the text is in English and French.

Copper in Instrumentation

The Copper Development Association, which is a research and information organization maintained by the British copper industry, has added a new book on the use of copper in instrumentation to its growing list of publications.

"Copper in Instrumentation" deals with the use of copper and its alloys in both ordinary industrial instruments and the ancillary equipment used for automatic control processes. The scope of the book has been restricted to instruments of types most commonly used in industry, and the purely electronic aspect of instrumentation has been omitted.

The subject has been divided into three main sections, and pressure- and strain-responsive materials, electro-magnetic instruments, and temperature-responsive instruments are discussed in turn.

Corrosion

Corrosion Prevention and Control is the title of a new monthly technical journal dealing with corrosion prevention, resistant

materials, equipment, processes, and products. The publication is octavo in size, and in addition to technical articles, contains reports of meetings organized by bodies such as the Corrosion Group of the Society of Chemical Industry. The new journal also contains news of technical developments and other activities of interest to the corrosion technologist.

Another monthly publication dealing with the same subject is *Corrosion Technology*, which has recently appeared as a supplement to the Leonard Hill publication *Chemical and Process Engineering*. It is expected that this supplement will gradually be enlarged and will finally appear as a separate publication.

The Gas Industry

Two new publications dealing with the gas industry are "The Register of the Gas Industry 1954" and "Who's Who in the Gas Industry 1954". Both are *Gas Times* publications.

Chemical Engineering Tables

The second part of the *Dechema-Werkstoff-Tabelle*, third edition, has now been published by Dechema, Deutsche Gesellschaft für Chemisches Apparatewesen, Frankfurt am Main, Postfach, Germany.

This standard reference book records the behaviour of some 100 constructional materials used in chemical engineering in the presence of approximately 1000 chemical agents.

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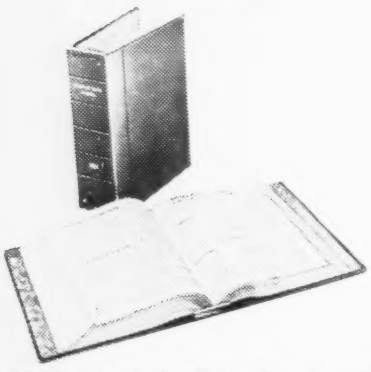
BINDERS FOR IP PUBLICATIONS



Some members of the Institute have remarked that, in their new size, the *Journal* and the *IP Review* are not easily accommodated in the bookcase in parts as received. Binders to hold a complete volume of twelve issues are now available which will serve both for permanent and for temporary binding. With this binder—the Easibind—there is no fear of loose copies being mislaid, as each copy is kept firmly in place whether the binder is full or not. The pages open flat. Binders, with the name of the periodical in gold on the back, are 13s each plus postage and packing (for one 1s 3d, up to four 2s) and are obtainable from Easibind Ltd., 84 Newman Street, London, W.1.

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INTERNATIONAL CONGRESS OF INDUSTRIAL CHEMISTRY

The twenty-seventh Congrès International de Chimie Industrielle is to take place in Brussels 11-19 September. It has been organized by the Société de Chimie Industrielle in conjunction with the Fédération des Industries Chimiques de Belgique.

The congress is to be devoted to study and discussion of scientific, technical, and economic questions concerning applied chemistry. Among the subjects which will be under discussion are: lubrication and lubricators, petroleum chemistry, corrosion and protection of materials, etc.

Further details can be obtained from Comité d'Organisation, XXVIIe Congrès de Chimie Industrielle, 32 rue Joseph II, Bruxelles, Belgique.

CORRESPONDENCE

THE OVER 60's

The Editor,
Institute of Petroleum Review.

Sir,

The White Paper issued in 1953 stated that in 1911 there was one person in fifteen over 60 in the country, and that in 1953 there were two people in fifteen, and in 1977 there would be three people in fifteen over 60.

Today, and for the past four years, the Government has refused to give any employment to professional men over 60—which is the normal retiring age—so that no man on retirement can hope to get further employment, either from the Government or by private enterprise.

What the White Paper did not do was to break down the total figures and estimate how many men in 1977 of the 10 million over 60 could be classified as wishing to continue their professional business life. The figure might roughly be between 20,000 and 40,000.

Since there is evidence that over the last four years the Ministry of Labour has not been able to find suitable occupations for the discarded professional engineers, and no employment bureau could do it either, it should be obvious that this waste of manpower will have to be dealt with, and all potential workers should be suitably employed. Other means must therefore be found.

The obvious solution is that each Institute, Institution, Society, Association, etc., should look after its own members over 60 who have retired, and who wish to be occupied in some suitable position. If this were arranged there would be no great difficulty in all who wished to work being suitably placed.

The reason given by the institutions for not giving any help in this matter is that if they did so they would be liable to pay income tax—which at the moment they are exempt from paying—so that either the charters would have to be altered or the income tax authorities would have to agree to the elderly members being helped to find suitable employment.

What was suitable when the charters were granted need not necessarily be suitable in 1954, and there seems no reasonable argument for perpetuating an obsolete law or regulation if it be against public policy and interest.

The position today actually is that there are some thousands of professional men who are not able to live on their pensions or their savings, and who do not wish to be idle: they all have about 40 years experience: all are suitable for some special work: and yet none are given employment simply because they are over 60.

On the other hand the various institutions ask their members to contribute to the benevolent fund which may be used for giving charity to the senile or those who are unable to help themselves.

But if the man were helped before he had become useless the probability is that he would die in harness and never call for the aid of the benevolent fund.

If sufficient thought and time were given to the subject all professional men over 60 could be suitably placed in "voids" since they cannot be used to fill "vacancies," as the promotion scale, the salary scale, and the insurance companies would prevent this being done.

This has been done on a small scale without the help of any organization, and actually 116 men out of 264 interviewed have been found suitable employment. The total number of applicants was 1685.

There are naturally exceptions and a few outstanding men are offered suitable employment, both by the Government and by private enterprise.

C. E. R. Sams.

c/o City and Guilds College,
Exhibition Road, London, S.W.7.
10.3.54.

Trade Literature Etc.

Ball and Roller Bearing Lubrication

A new addition to the Vacuum Oil Company's series of technical publications is a booklet entitled, "Ball and Roller Bearing Lubrication", which has been designed to present factual information on this subject in a way that operators can clearly understand.

After a brief description of the basic principles of operation, maintenance, and replacement procedure, the booklet goes on to deal with the problems of oil selection to suit the wide range of conditions in which ball and roller bearings may have to operate.

The booklet is illustrated with numerous diagrams, and copies can be obtained from the Company, free of charge.

Steel Pipes

An up-to-date catalogue of steel pipes for water, gas, sewage, and air, has recently been published by Stewarts and Lloyds, Ltd. The new publication takes the form of a well-illustrated book which provides detailed guidance on selection and use, as well as a survey of available equipment.

Selective Weed Killers

The use of chemical weed killers in agriculture has become increasingly widespread, and new methods of weed control are constantly being developed to assist the farmer. The part played by Shell Chemicals Ltd. in these developments can be seen from a new booklet, "Shell Selective Weed Killers", which has been produced to help farmers to find the best solution to problems concerning weeds.

The booklet contains sections on the classification of weeds and the choice of herbicides and equipment, as well as the chemical formula and recommended methods of application for each type of weed killer.

"Borascu"

A new non-selective weed killer has been produced by Borax Consolidated Ltd., which is suitable for use in areas where all vegetation is to be destroyed. It is slow acting, but is said to prevent re-growth for a considerable period of time.

Combination Processing

A detailed analysis of the savings which can be made by integrating a number of different refinery processes into one continuous operation is contained in an illustrated booklet published by the M. W. Kellogg Co. The booklet, which is Kellogram No. 1 (1954), is available from Kellogg's Refinery Process Division, 225 Broadway, New York 7, N.Y.

Reducing Evaporation from Tanks

A booklet published by the Chicago Bridge and Iron Co., Illinois, gives details of systems which can be used to reduce evaporation loss from standing storage tanks handling petroleum products. The Hortondome roof, Vaporsphere, and Vaportank, which are described, provide a variable-volume vapour space which allows the air-vapour mixture above the liquid in tanks to expand and contract without venting vapour to the atmosphere.

New Wallchart

A brightly-coloured pictorial wallchart, illustrating the way in which benzole is produced, has been published by Educational Productions Ltd., in collaboration with the National Benzole Co. Ltd. The chart, which is intended primarily for use in schools, traces the production of benzole from its beginning as a by-product of coal, through the processes of crude refining and distillation to its use in the local garage.

Oil Valves

Messrs Alley and Maclellan Ltd., have published a new oil valve catalogue giving diagrams and details of their present range of products.

Over 300 employees can be served at one sitting in this newly-built cafeteria at the Vacuum Oil Company's Coryton refinery.

* * *

CRUDE OIL PRODUCTION

	Jan. 1954 *Tons*	
Qatar Petroleum Co. Ltd.	382,012	
	Feb. 1954 *Tons*	*Jan.-Feb.* '54 *Tons*
Basrah Petroleum Co. Ltd.—Zubair .	305,767	582,195
Iraq Petroleum Co. Ltd.—Kirkuk .	1,761,478	3,732,735*
Mosul Petroleum Co. Ltd.—Ain Zalah and Butmah	96,701	203,803
Qatar Petroleum Co. Ltd.	347,308	729,320
Kuwait Oil Co. Ltd.	3,098,895	6,425,653
Kern Oil Co. Ltd.:	*Brl*	
California	97,866	205,894
Trinidad	76,389	161,390

*This total includes the production figure for January which has now been amended to 1,971,257 tons.

* * *

SYMPOSIUM ON ANALYTICAL CHEMISTRY

The Midlands Society for Analytical Chemistry has organized a Symposium on Analytical Chemistry which will be held at Birmingham University from 25 August to 1 September this year.

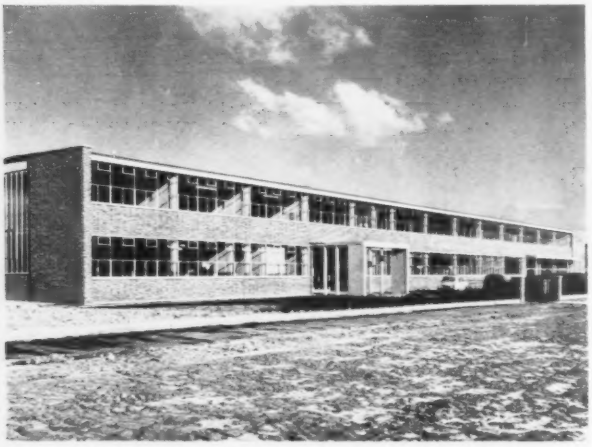
The Symposium will include: the delivery of original papers; reviews of recent advances in analytical chemistry as applied in selected branches of industry; reviews of advances in specialized fields; an exhibition of new scientific equipment; demonstrations of modern analytical techniques; a display of historical scientific literature, and visits to local industry.

Additional information can be obtained from Dr J. W. Robinson, 139 Stourport Road, Kidderminster, Worcs.

Notes of the Month

W. Edwards & Co. (London) Ltd.

In October 1953 the firm of W. Edwards & Co. (London) Ltd., makers of high-vacuum equipment, moved from somewhat cramped premises in London to a new and spacious building at Manor Royal, Crawley, Sussex. On 5 March a large gathering made up of professional staff from universities, etc., executives from research institutes, government centres and industrial companies, the Company's technical advisers, and representatives



The new premises of W. Edwards & Co. (London) Ltd. at Manor Royal, Crawley.

of the scientific press assembled at Manor Royal for the official opening ceremony.

The visitors were first conducted around the new factory and were able to examine at first hand its excellent facilities for the design, manufacture, and testing of the large variety of vacuum equipment and accessories produced by the Company.

During the morning two trees to commemorate the event were planted, one by Sir Ben Lockspeiser, K.C.B., secretary to the DSIR, and the other by Frederick D. Edwards, managing director and founder of the firm.

At a luncheon attended by over 300 guests, the toast of the guests was proposed by the Rt. Hon. Lord Wilmot of Selmeston, P.C., J.P., Chairman of the Company, and responded to by Prof E. N. da C. Andrade.

During his proposal of the toast of "The Company and High Vacuum", Sir Ben Lockspeiser said that the Company occupied "a unique position and served both industry in the newest technology and science in its most advanced technique, in discharge tubes of all kinds, in the electron microscope, in the separation of isotopes, in accelerators for nuclear particles, and in various branches of metallurgical research."

Esso Cambridge

Following rapidly upon the launching of the *Esso Canterbury*, has come news of the launching of a sister ship, the *Esso Cambridge*, from the Birkenhead yard of Messrs Cammell Laird. This is the fourth of six 26,650-ton tankers commissioned at British shipyards for the Esso group of companies.

The launching ceremony was performed by Mrs Waterston, wife of A. Waterston, a director of Esso Petroleum Co. Ltd.

Speaking at the luncheon following the launching, William E. Jenkins, C.B.E., managing director of Esso Petroleum Co. Ltd., commented on the urgent need for speed in production.

"If we seek to have our tankers built in the shortest reasonable time," said Mr Jenkins, "it is not to say we are regardless of the cost; on the contrary we pay strict attention to such matters. The reason is that the sooner we can put them into operation, the sooner will they begin to assist in lowering the cost of transportation with all the consequent advantages which lower costs mean to our economy."

From the shipbuilders' point of view likewise, said Mr Jenkins, the sooner ships went into service, the sooner would they begin to wear out and require replacement. In this way, everyone derived benefits from speedy performance.

Aerial Photography Assists in Pipeline Scheme

Aerial photographs are being used to plan a 350-mile pipeline for carrying natural gas from Sui in Baluchistan to Karachi. The discovery of gas at Sui is expected to allow Pakistan to dispense entirely with coal importing, the heat value of the gas being equivalent to about 1,600,000 tons of coal annually.

The aerial survey has been carried out by the Photographic Survey Co. Ltd., a Toronto company of the Hunting Group. 400 line miles of large scale (1 : 24,000) photography were taken of a strip three miles wide in order to provide semi-controlled mosaics at 1 : 12,000 scale. Final mosaicing of the photographs will be carried out in London by Hunting Aerosurveys.

Progress of Aden Refinery

It is hoped that Anglo-Iranian's new oil refinery at Aden will be ready for use by December this year, and both employees on the site and manufacturers of equipment are striving to complete their work by the scheduled date.

A feature of the new plant will be two electrically-operated desks each controlling a 60,000-b.s.d. crude distillation unit. One of these control desks has already been completed by Evershed and Vignoles, Ltd. to the instructions of Messrs E. B. Badger & Sons Ltd.

Each desk has been designed to fit into a bay window overlooking the plant, and the process is illustrated by a coloured

An Anglo-Iranian photo

One of the two electronic control desks for distillation units which are to be installed at Anglo-Iranian's new oil refinery at Aden.

mimic flow diagram with indicators and controller adjustments mounted at appropriate points.

The electronic controllers are arranged as plug-in units and are nested in cubicles in the side wings of the desk. Miniature recorders are provided for temperature, flow, and pressure records, etc. In addition to being recorded, the quantities of the various products are totalized by electrical integrators mounted in the side wings.

Signals from the measuring elements of the plant are transmitted to the control room and the controllers are connected to electro-pneumatically operated valves on the plant.

U.S. Investment in British Industry

In a recent address to the Hants and Dorset Branch of the Institute of Industrial Administration at Southampton, Norman Biggs, a director of Esso Petroleum Co. Ltd., referred to the activities of his company as a good example of productive American investment in Britain.

Mr Biggs emphasized the desirability of American capital investment in Britain and said that if we were going to have any worthwhile increase in this direction, we could look for it only in direct investment by American business corporations.

Speaking of the construction of the Fawley refinery, Mr Biggs said that over 75 per cent of the materials were bought in Britain. "The proportion would have been higher," said Mr Biggs, "if the delivery delays here had not been such as to suggest that the continued dollar outlays for finished products would have exceeded the possible savings on dollar equipment."

New Bottled Gas Plant

To keep pace with the increasing demand for bottled gas, particularly in rural areas where isolated buildings have no constant electricity and gas supply, the bottled gas plant at Anglo-Iranian's Grangemouth Refinery is to be extended. New plant for bottling gas as a liquid will be ready early next year, increasing the refinery's present capacity of 7000 tons a year to 16,000 tons.

Already, four Hortonspheres for the storage of liquid butane under pressure have been installed, together with three propane storage vessels. Work will start shortly on the erection of a new filling shed, and, later, automatic handling and bottle-filling machines will be installed.

Near the new plant, a thirty ton weighbridge is to be installed from which bulk supplies of the bottled gas can be loaded on to lorries or rail trucks.

International Instrument Congress

The First International Instrument Congress and Exposition is to be held in Philadelphia from 13 to 25 September this year. It has been sponsored by the Instrument Society of America and will take place in the Philadelphia Museum and Convention Hall. Many technical sessions have been planned and there will be an extensive display of exhibits.

Safe Driving Awards

In the 1953 national safe-driving competition, sponsored by the Royal Society for the Prevention of Accidents, 3304 awards were won by drivers employed by Shell-Mex and B.P.

The company has a bonus scheme whereby commercial vehicle drivers receive an annual award of £2 for driving without an accident for which they are to blame. In addition, the company pays a bonus of £5 on each occasion a man receives the Society's award for five consecutive years of accident-free driving.

★ ★ ★

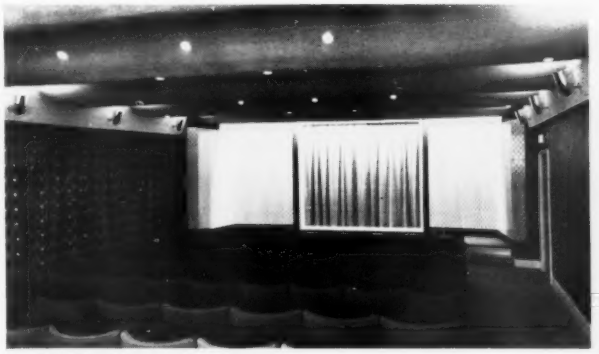
THE STORY OF OIL

"The Story of Oil" exhibition, presented by The Shell Petroleum Co. Ltd., has now returned to London after a successful tour of selected cities in the U.K. It will be on view at the Science Museum, South Kensington until 9 May, from 10 a.m. to 6 p.m. on weekdays, and from 2.30 to 6 p.m. on Sundays.

The exhibition shows how science is applied in the search for oil and throughout its production. Emphasis is given to the important part played by the engineer in oil operations, and special panels are allocated to marine transport and pipeline systems.

New Cinema

A new private cinema has been opened in Shell-Mex House by Shell-Mex and B.P. Ltd. The cinema has seating accommodation



The auditorium of the new Mezzanine Cinema at Shell-Mex House.

for 102 persons and the auditorium has a high standard of acoustics and comfort.

Apart from the showing of films to invited audiences, the cinema will also be used to give regular film shows for company staff, to assist courses of instruction, and in the production of the Company's own films.

The projection room of the new cinema is equipped with the latest Philips 35-mm projectors, and will also have facilities for 16 mm, film strip, slide, and epidiascope projection.

Shell-Mex House Comes of Age

London's biggest office building, Shell-Mex House, celebrated its coming of age in March this year, for it was first fully occupied by the staff of Shell-Mex and B.P. Ltd. at the beginning of March 1933.

The building has its own boiler room (heating the building through 22 miles of pipes), first aid post, restaurants, cinema, and teleprinter system, and there is communication by radio to ships of the fleet of Shell-Mex and B.P. tankers around the coasts of Britain.

It was the wartime centre of the Petroleum Board and is now the headquarters of the Ministry of Supply.

British Equipment for new Australian Refinery

The first atmospheric tower for Sydney's new Kurnell refinery was shipped to Australia recently. Because of its size, 134 ft 9 in long, 104 tons in weight, it had to be divided into two pieces, the smaller measuring 51 ft 7 in and weighing 33 tons—the larger 83 ft 2 in and weighing 71 tons.

This equipment has been made for Australian Oil Refinery Ltd., an affiliate of Caltex (The California Texas Oil Co. Ltd.), by Babcock and Wilcox Ltd.

Progress at Plungar

The third of a series of wells being drilled at Plungar, near Nottingham, by the D'Arcy Exploration Company (Anglo-Iranian's prospecting subsidiary) has reached a depth of 800 ft. This well is 1000 ft from well No. 2, where oil in commercial quantities was found at a depth of 3029 ft. A short distance away is well No. 1, from which 3½ tons of crude oil a day are being pumped.

Drilling has begun at a fourth well at Plungar, and another site has been chosen for a fifth well.

New Shell Tanker

A new tanker to join the Shell tanker fleet was launched recently from the shipyard of R. & W. Hawthorn, Leslie & Co. Ltd., at Hebburn-on-Tyne. The launching ceremony was performed by Lady Thomas, wife of Sir Miles Thomas, D.F.C., chairman of BOAC, and the tanker was named *Haustellum*.

A Shell photo

Launching of s.t.s. "Haustellum". On the platform were (left to right) *Mrs Hulton; Sir Miles Thomas, D.F.C.; A. S. C. Hulton, managing director of Shell Tankers Ltd.; Lady Thomas; Sir Philip Johnson, a director of R. & W. Hawthorn Leslie & Co. Ltd; F. A. C. Guépin, a managing director of The Shell Petroleum Co. Ltd., and Mrs Guépin.*

She is one of a new class of 52 general-purpose tankers for the Shell tanker fleet, of which four are already in service, including another Hawthorn-Leslie ship, *Haustrum*.

★ ★ ★

CONSTRUCTION OF ESSO REFINERY, FAWLEY

The immense Esso refinery at Fawley was officially opened in July 1951, six months ahead of schedule, an achievement so unusual with a project of this size that special investigations were undertaken to analyse the management policies and practices responsible.

A report of these investigations, "Construction of Esso Refinery, Fawley", by A. P. Gray and Mark Abrams, has now been published in booklet form, by the British Institute of Management, in the belief that there is much of real value to be learned from this successful enterprise.

The report is divided into two main sections: top level organization policy and labour-management relations. The first section emphasizes the advantages obtained by: concentration of the work under one contractor; good co-operation between contractor and client; early and detailed planning; energetic and constructive supervisory methods employed by the Americans; accurate control of materials, work, and costs; and effective methods of communication on the site.

The second section of the report emphasizes the main achievements in the control of labour, which are considered to be:

(*a*) A large labour force, including large numbers of skilled tradesmen, was rapidly built up and retained in spite of difficult circumstances.

(*b*) There were no major stoppages of work over labour disputes.

(*c*) The man-hours expended in building the refinery were almost exactly the same as the original estimate.

This section of the report describes the factors which contributed to labour control: the union contract; discipline and control of working time; amenities for the labour force; union relations; the machinery of Union negotiations; and the rôle of American supervisors.

Forthcoming Meetings

THE INSTITUTE

(*At* 26 *Portland Place, London, W.*1, 5.30 *p.m.—tea* 5 *p.m.*)

Summer Meeting. The Rôle of Petroleum in Modern Transport Llandudno. **12-15 May**

Medical Services in the Petroleum Industry. 19 May

IP LONDON BRANCH

(*At* 26 *Portland Place, London, W.*1, 6 *p.m.—tea* 5.30 *p.m.*)

Branch Forum. 18 May

★ ★ ★

ASSAM OIL SEARCH

Tests of the newly-completed No. 2 Well at Nahorkatiya, Lakhimpur, where sub-alluvial oil in Assam was struck for the first time last year, show it to be a satisfactory producer, the Assam Oil Company announces from Digboi.

On initial testing the new well, 10,520 feet deep, proved to be similar to the discovery well, which is yielding an average of 500 barrels of crude daily. Prolonged tests to establish steady production will have to wait until the 8 inch pipeline to the Digboi refinery is complete.

The first two wells, a mile or so apart on the south bank of the Burhi Dihing river, penetrated oil-bearing sandstones deep under the alluvium of the Brahmaputra Valley in this area of Assam. The AOC is to start drilling a third exploratory well this month and a fourth later this year. Locations for other wells have been chosen.

Digboi, 17 April 1954.

★ ★ ★

SITUATIONS VACANT

Assistant Oil Storage Manager required, age 30-35, for Ocean Installation on the Thames, handling all types of Hydrocarbon and Vegetable oils. Imperative that applicants have had wide experience on a similar type of installation. Knowledge of Customs formalities and routine laboratory work an asset. Salary according to experience. Superannuation Scheme. Apply in writing to Personnel Manager, Samuel Williams & Sons Ltd., Dagenham Dock, Essex.

Applications are invited by the **Vacuum Oil Company, Limited,** for the positions of **Junior Engineers** at the Coryton Refinery, Essex. Applicants must have a Mechanical Engineering degree and preferably mechanical experience in the petroleum or chemical industry. However, applications from graduates who have recently left university will be considered. Salaries are progressive and opportunities for promotion excellent. Conditions of employment include a Pension and Life Assurance Scheme and Sickness Benefit Plan. Applications giving full details and quoting reference "J.E." should be addressed to the Industrial Relations Superintendent, Vacuum Oil Company, Limited, Coryton, Essex.

Reservoir Engineer required by the **Department of Mineral Resources, Province of Saskatchewan, Canada,** to deal with the valuation of oil and gas reservoirs and problems connected with pressure maintenance, secondary recovery and other problems connected with petroleum production. For application forms please write to Mr. Graham Spry, Agent General for the Government of Saskatchewan, 28 Chester Street, London, S.W.1.

Crown Reserve Administrator, Department of Mineral Resources, Province of Saskatchewan, Canada, to direct technical staff in evaluation of Petroleum and Natural Gas Crown Reserves using Electrologs, core analysis, drill stem tests, etc., and make recommendations to the Department on methods and timing dispositions. The incumbent would be responsible for establishment of a Crown reserve inventory and maintenance of records on development of Crown reserves. He would be responsible also for conducting negotiations on disposal of Crown reserves with development companies as well as advising the Department on problems of the working agreements in addition to checking on development and operations. Broad experience in resources development with general administrative experience necessary. Geological or petroleum engineering training helpful but not essential. The ability to generate ideas and direct programmes is more important than high technical qualifications. Salary range—$481.00 to $566.00 per month. For application forms write to Mr. Graham Spry, Agent General for Government of Saskatchewan, 28 Chester Street, Belgrave Square, S.W.1.

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War on the Locusts

A SINGLE swarm of locusts may weigh 20,000 tons and eat its own weight in green food every day.

To combat this menace Anglo-Iranian scientists have helped to produce an effective carrier for poison. But the surest control of locusts lies in the cultivation of their breeding grounds. This means mechanised farming equipment — and oil-power in plenty.

Anglo-Iranian is getting the oil. Throughput will soon reach a peak of 30,000,000 tons a year. This oil is shipped to the far corners of the world in one of the world's largest privately-owned tanker fleets. From Iceland to New Zealand Anglo-Iranian products are speeding the pace of progress.

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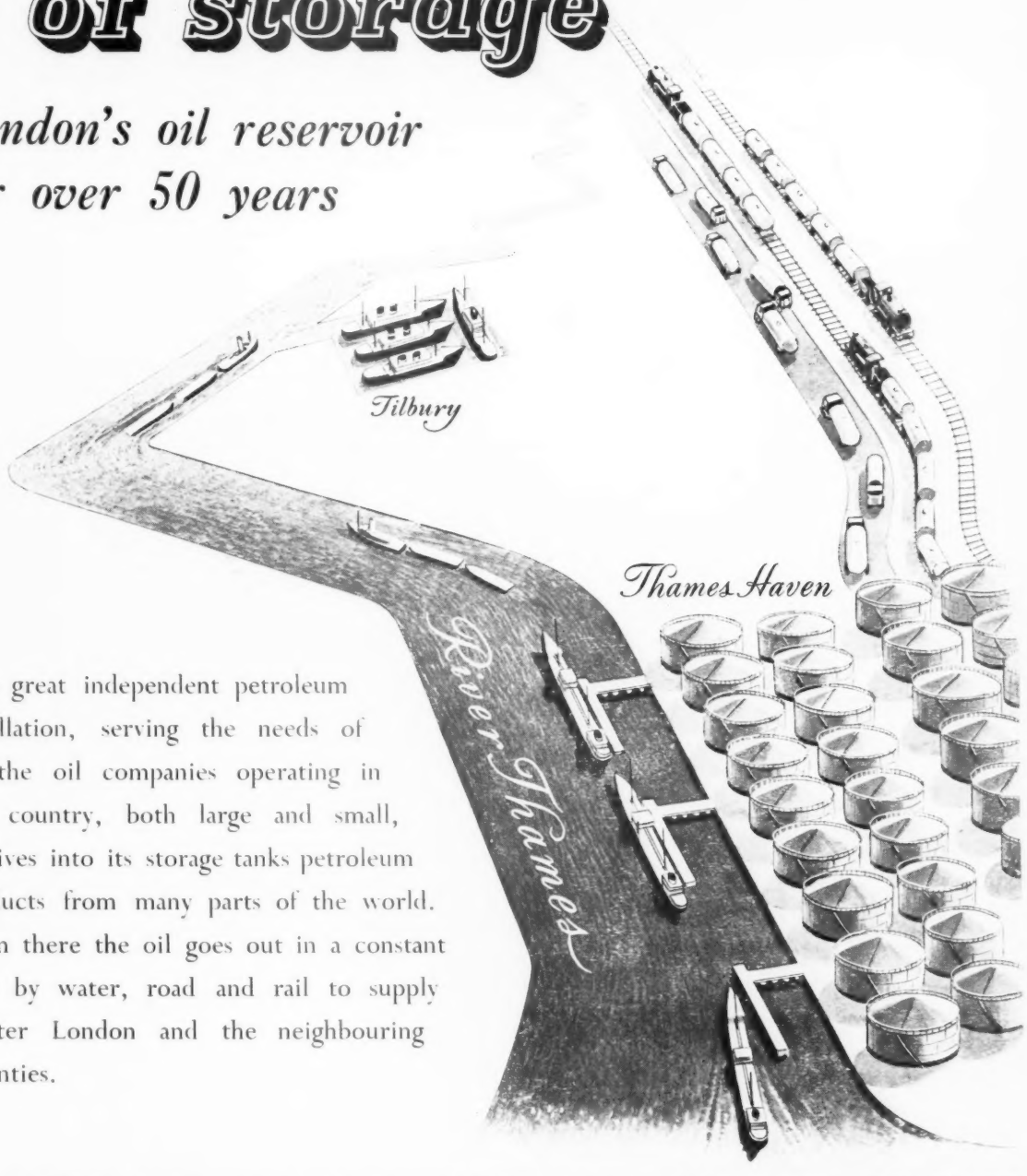

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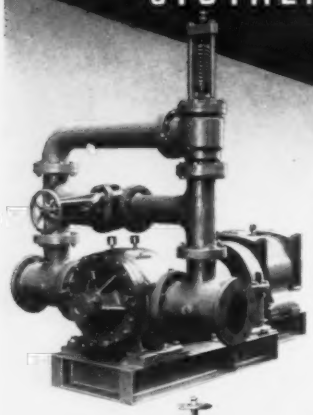
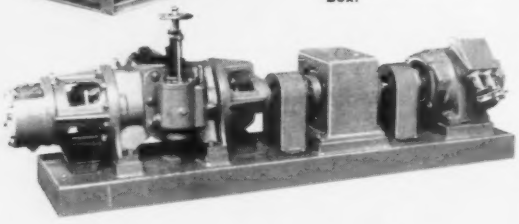


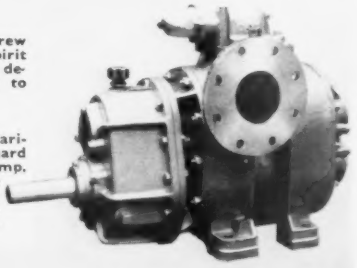
(Left)
Positive Acting Rotary Displacement Pump for the handling of Molasses and viscous fluids, electrically driven through totally enclosed Reduction Gear Box.

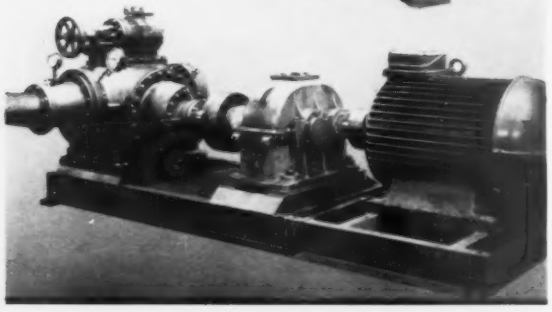
(Below)
Positive Acting Screw Displacement Spirit Pump, electrically driven through Wall Box.



(Right)
Positive Acting Screw Displacement Spirit Pump specially designed for fitting to Road vehicles.

(Below)
Positive Acting Variable Output Guinard Rotary Piston Pump, electrically driven through Reduction Gear Box, for Oils of varying viscosity.





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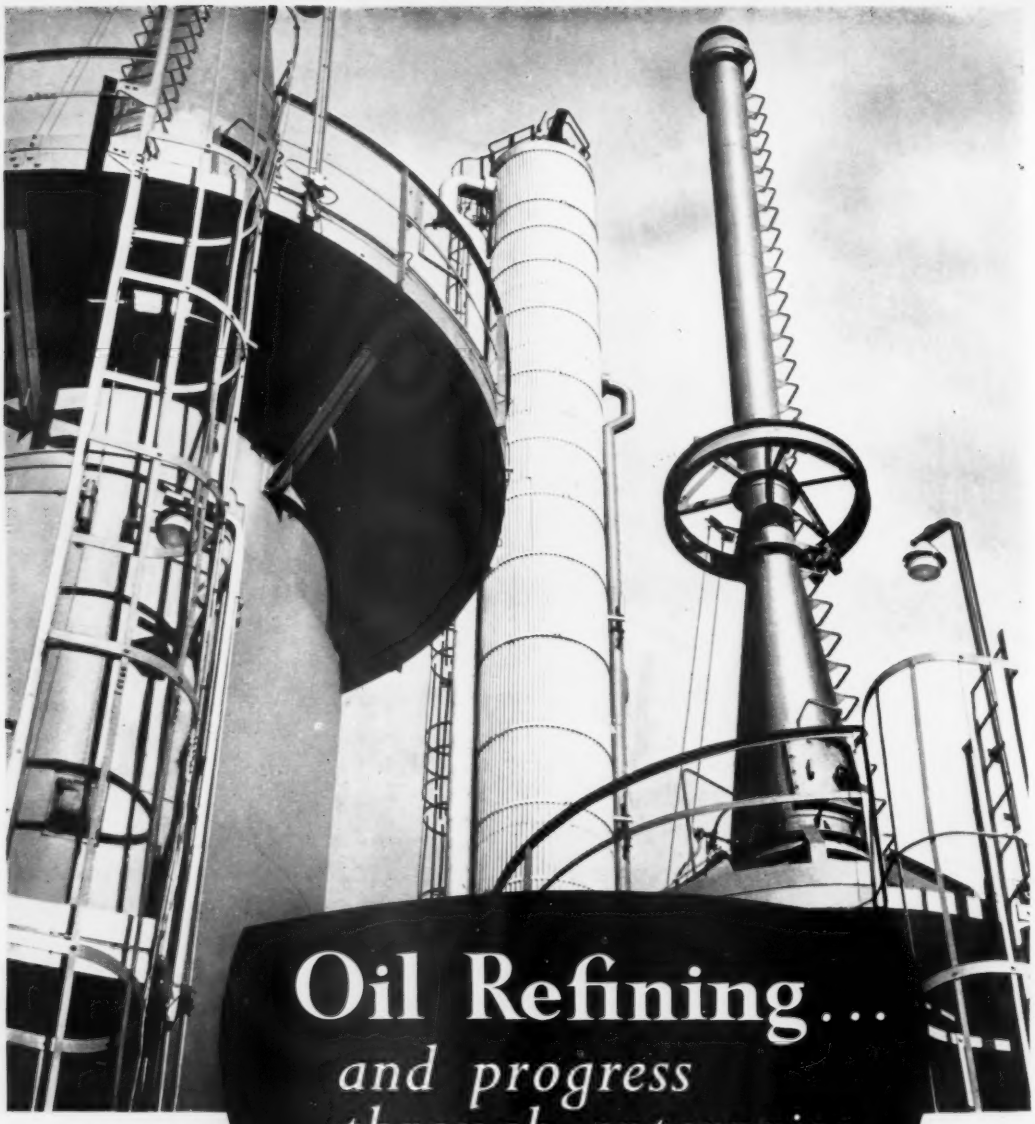

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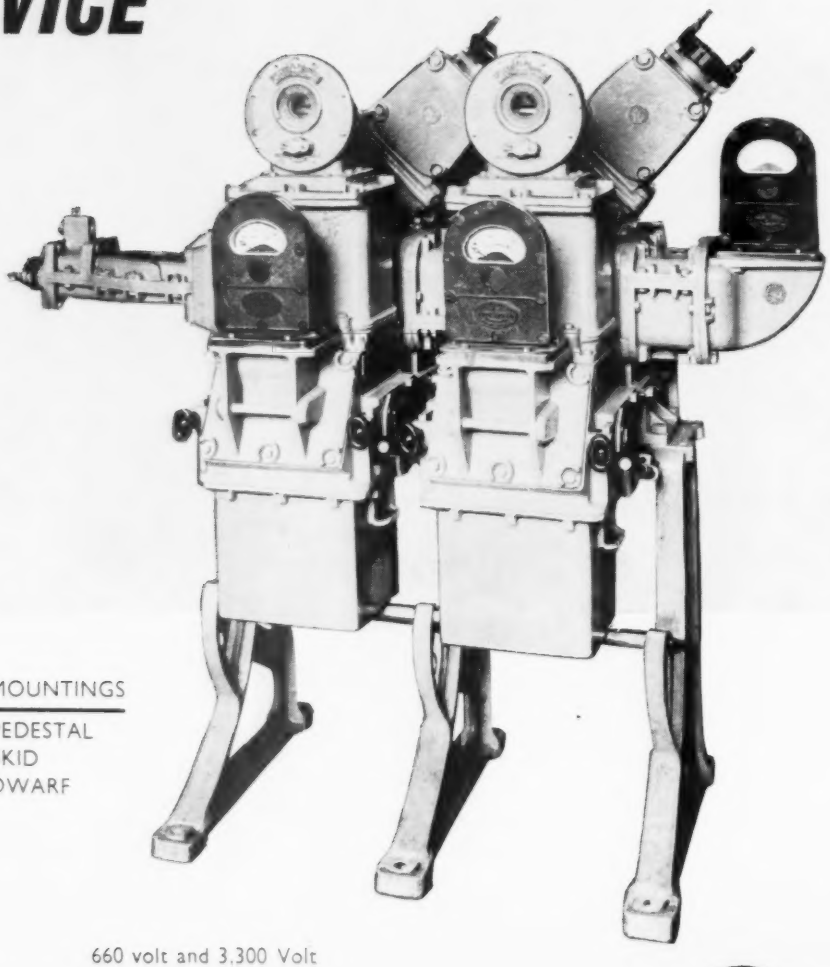

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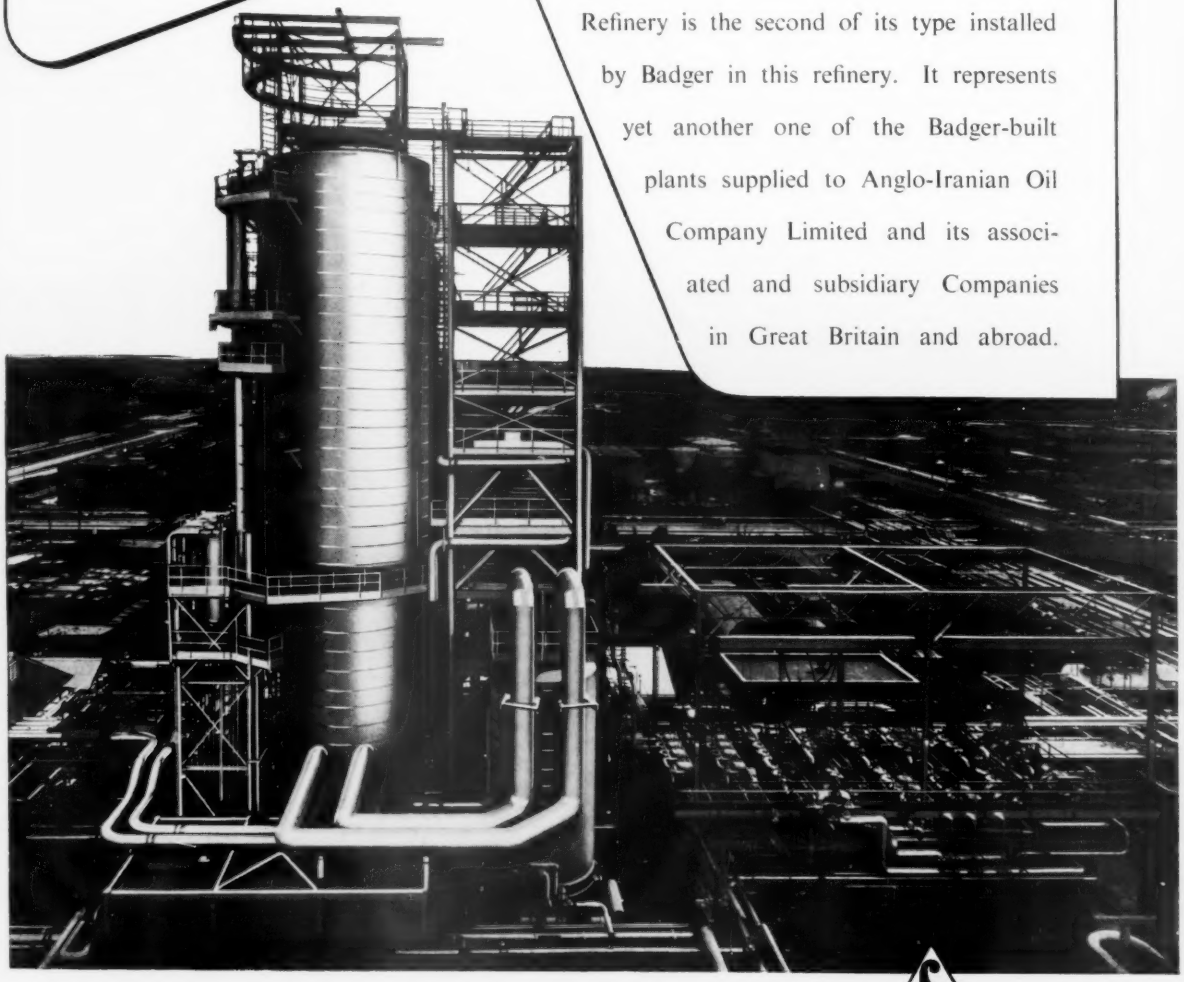

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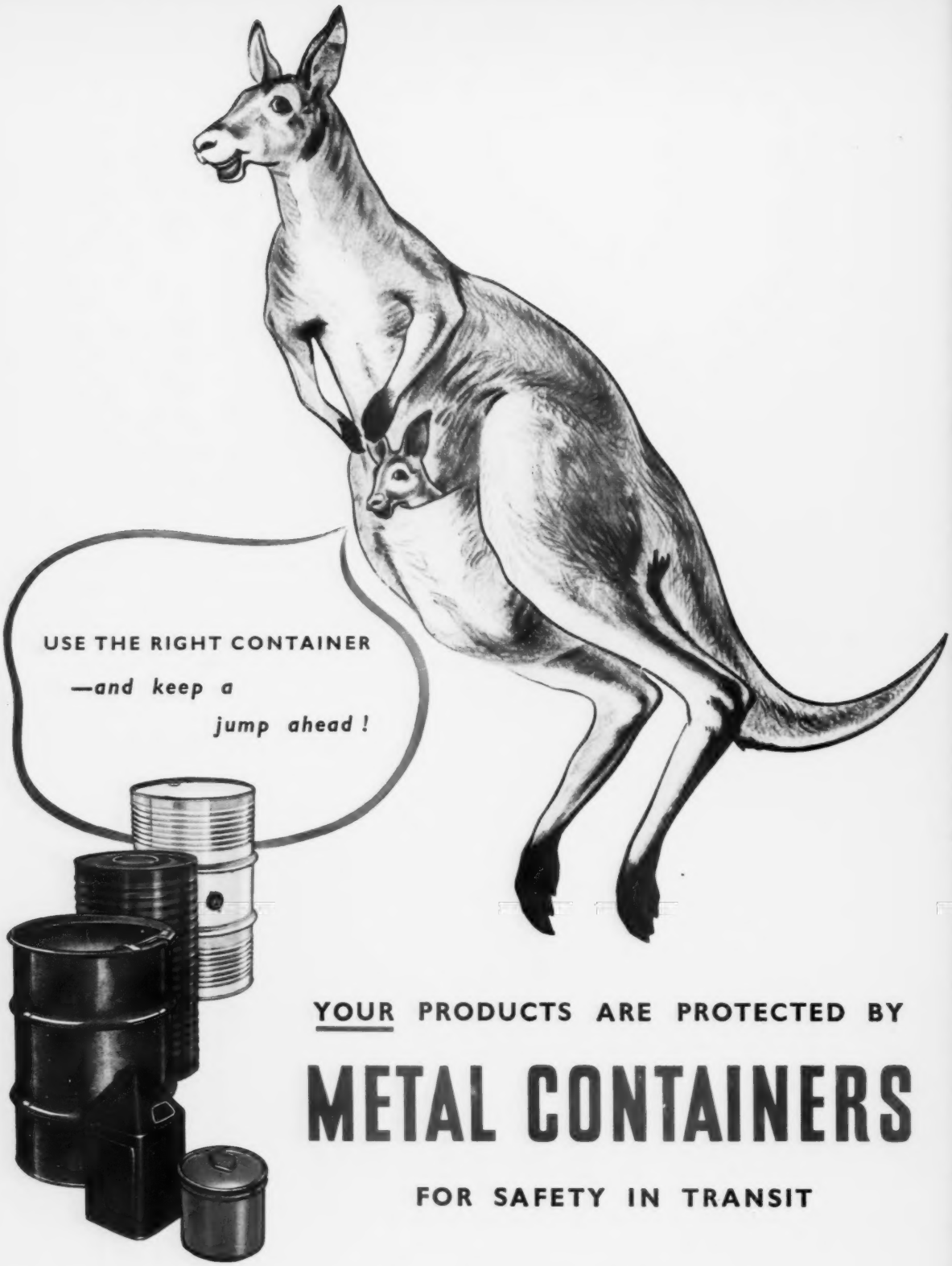

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